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MINNESOTA MEDICINE

Journal of the Minnesota State Medical Association

VOL. IV DECEMBER, 1921 No. 12

ORIGINAL ARTICLES

PAINFUL SCARS*

J. F. CORBETT, M. D.
Minneapolis, Minn.

The purpose of this paper is to discuss the cause and the treatment of pain in scars when this is so severe as to result in a major disability. This paper will not discuss the discomfort in scars due to the fixation of attenuated blood vessels in connective tissue. Changes of weather cause these scars to give discomfort. Physiotherapy, hydrotherapy and various forms of heat and light seem to render the blood vessels in scar more elastic and less troublesome.

Most of the extremely painful healed wounds have been in amputation stumps. The cut nerve and its invariable subsequent neuroma has long been recognized as a cause of pain in amputation stumps. Various remedies have been sought. It was early learned the repeated cutting of the nerve did not bring relief. Often after repeated section of the nerves the patient, driven to the use of morphine to obtain relief of pain, became an addict.

Neuromata occur in many other localities and often give rise to puzzling pictures that are usually diagnosed as something else. A careful examination will usually disclose the character of the lesion; yet the diagnosis of painful neuroma is not often made outside of amputation stumps. Neuroma of an intercostal nerve in one case to my knowledge led to an exploration of the left upper abdomen.

Before considering the means of diagnosis and the remedy for neuromata a thorough understanding of the pathology is necessary. Every time a nerve is cut there will in time occur a sort of healing of the cut end. This healing manifests itself as a swollen round or more or less oval mass usually at the end of the cut. This has been called a neuroma. We are told that they are not true neuromata but consist largely of scar tissue with some nerve fibrils. There may be variation in the proportion of these elements but it is of minor importance whether or not there is a large ball on the end of a nerve or a small one. In place of occurring at the end of a cut nerve, similar masses of connective tissue may occur anywhere in the course of a nerve provided that structure has been so traumatized as to interrupt some of the neuraxes. These fusiform swellings in the course of a nerve are referred to as central neuromata. As to the histological structure of neuromata the following facts may help to clear the subject. When a nerve is cut in part or totally, the neuraxes start to grow in a straight line if not interrupted. At the same time the growth of neuraxes starts there is coincident increases of the scar tissue. As a result there occurs an attempt on the part of the neuraxes to grow and this attempt is thwarted by the connective tissue. Then the neuraxes try to force their way. Not being able to do this they often twist themselves into spirals and corkscrew-like bodies. These were first described by Perroncito. The ordinary neuroma under the microscope shows more or less scar tissue and in this scar are numerous Perroncito fibrils. Some of these neuromata have caused pain, others have been only sensitive when pinched or struck. I have not been able as yet to differentiate histologically between the painful variety and the other. From clinical records I am of the opinion that the cause of pain is not in the histological structure of the neuroma itself but is due to extrinsic causes. By extrinsic causes is meant this: that every neuroma is potentially painful but it is only when they are irritated by the pulse wave of a contiguous artery or by a spicula of bone or by a strong muscle contraction

*Presented before the Minnesota State Medical Association, Duluth, Minn., August, 1921.

or some other agent that they become actually painful. An alcohol injected nerve with no neuroma in one instance gave pain. The end of this neuroma was bound to the end of the cut humerus. The ordinary neuroma is painful because these delicate nerve fibers in the Perroncito fibrels are irritated.

Many devises have been tried to prevent the occurrence of neuromata. These include cutting the nerve with the cautery, with a sharp knife, tying ligatures about the nerves, and various plastic operations on nerves. None of these have proved satisfactory. On the other hand injection of alcohol into the nerve according to the method of Lewis and Huber seems to give results. The nerves so injected do not form bulbous neuromata but end as fine spindles or terminate abruptly. The alcohol seems to inhibit the down growth of the neuraxes and to lessen the increase of the scar to a neuroma.

The ligation of a blood vessel and a nerve en masse is a frequent cause of neuromata of peculiarly painful character. In case of F. this had been done and as a result he suffered with an intense neuralgia intensified by the pounding of the pulse. He had an amputation of the leg done for a gun shot injury three years before his last operation. Constant attacks of pain harassed him at night. These pains he described as being in the ankle and the front of the instep of the amputated limb. After doing a reamputation I dissected the specimen removed and I found the anterior tibial artery and anterior tibial nerve tied in a common mass. There was only a small sized neuroma. He, in fact, was disabled completely for three years but was relieved by reamputation and alcohol injection into the nerve trunk. The accidental occlusion of a nerve is especially apt to occur in abdominal work with the right rectus and Kocher incision. The pain these patients suffer is sometimes interpreted as due to adhesions. More especially are these cases deceiving in that if the nerve is simply irritated by the ligature and not cut we may have muscle spasm as a result and yet have no underlying inflammatory pathology. The same principle is illustrated in a patient upon whom a nephrectomy for multiple stones had been done. This patient had been relieved of his kidney stones but suffered almost as much after the operation as before. He was suspected of malingering. Neurologogical examination showed disturbances of sensation along the course of the ilio-inguinal nerve. A second operation disclosed the fact that the nerve had been ligated with the accompanying artery. At the point of the ligation a lateral neuroma was found. Cutting the nerve relieved the pain and it did not return.

Another supposedly obscure abdominal case was that of A. M. This patient suffered from pain in the distribution of the eight dorsal nerve. There was no absolute anesthia but a definite band of hyperesthesia and hyperalgia occurred corresponding to the neuralgic area. His history told that he had been shot in the chest and later had to have a tube in the plural cavity to drain the resulting empyema. Part of a rib had been trephined for the drainage tube. His pain developed soon after the drainage. On exploration we found a rough sharp end of the rib impinging on one of the intercostal nerves. When the nerve was dissected a central neuroma was found at the sharp point of bone. The bone was cut off squarely and about one inch of the nerve resected and the proximal segment was injected with alcohol. The pain was relieved and the patient had a narrow strip of anesthesia where he formerly had hyperesthesia.

One more case deserves especial mention. Miss M. had been operated upon for a benign tumor of the breast. Healing occurred but she suffered intense pain. A second operation was done but the pain persisted. Physical examination showed a wide scar on the region of the breast. In this scar tissue occurred a small hard mass that was extremely tender. On operation I found a neuroma. Alcohol injection resulted in a cure. In this case careful plastic work was done but in spite of the fact that tissues were approximated without tension the patient has a wide scar but a painless one.

In making a diagnosis of neuroma the following points have occurred again and again. The pain is almost always referred to some part or parts of the missing limb in amputation cases. In other cases the pain is referred to

the distribution of the involved nerve. If section is complete the area of cutaneous distribution will exhibit anesthesia. If the division is partial, then hyperesthesia and hyperalgia occur in about the same place. The neuroma itself is tender on pressure. Palpation sends sharp shocks of pain along the nerve course and we can feel the neuroma.

One of the greatest difficulties is to be sure that all of the neuromas have been found. A small cutaneous nerve may have developed in it a very painful neuroma. If other larger ones exist it may be difficult to determine upon the little ones. Not long ago I operated upon a paient who had a painful condition of the median nerve, on account of injury that resulted in the scar binding down that nerve. Neurolysis did not completely relieve the pain although anesthesia disappeared and motor function returned to the paralyzed muscles. On second operation I found a small neuroma in one of the cutaneous nerves of the region. Resection and alcohol relieved the pain. One learns to look for a neuroma in the large trunk but is apt to forget that there are endless branches of the cutaneous nerves and any one of them may be the seat of trouble. I will use another case to further illustrate this same point.

G. had been operated upon for neuroma. Enormous neuromata had been cut out in December 1920; in February they had recurred and I injected the three main trunks of the branchial plexus after cutting down upon them. No marked improvement occurred. His arm was so painful I could not make a satisfactory examination of it. So at the next operation I raised the skin from the entire stump and shoulder. I found five more neuromata that had not been injected. The nerves that had been injected did not show any neuromata but ended as fine spindles. The end result in this case will not be known for some time.

CONCLUSIONS

1. Surgeons should pay more attention to nerve supply and conserve nerves when possible.

2. Blood vessel ligatures should not include nerves.

3. In amputation cases or whenever a nerve must be cut the proximal part of the nerve should be injected with alcohol with purpose of preventing a neuroma.

4. In all operations upon nerves associated with pain, watch must be kept for neuromata in small unimportant nerves.

5. Neurological examination may reveal nerve lesions in cases presenting themselves for reoperation for "adhesions."

6. After alcohol injection of a nerve the nerve stump should be so planned that it will not be subject to irritation.

DISCUSSION

DR. ARNOLD SCHWYZER, St. Paul: Whenever we have a paper from Dr. Corbett we always know it is something worth listening to. The doctor speaks of painful scars. We may have painful scars over the tibia or epicondyle. We may have adherent scars over exposed bone where we do not need to have this neuroma in a macroscopic sense. What he has given us here is present in these mentioned cases in a more microscopic form. He has mentioned the role that irritation plays. If we have an adherent or painful scar we feel that it is necessary to remove the adhesions. In making the incision it is better to cut these fine nerves, and in order to prevent adhesions we should do some sliding plastic operation.

He has spoken about neuroma, which is the most important formation that we have in painful scars. Neuroma, the—oma like in papilloma, carcinoma, fibroma, gives the impression that we have a neoplasm, but these formations are not neoplasms; they are inflammatory products. Although microscopically we may not be able to differentiate them if we do not know the history, they are inflammatory. How to deal with these irritations, whether they be an amputation neuroma or a neuroma due to some crushing of the nerve in its course, is the problem that confronts us.

I have handled a number of these cases, and I am not so enthuusiastic about them as I used to be. When Dr. Corbett mentioned the subject this morning to me, two cases came to my mind that are rather interesting.

One case was a hernia operation that I had performed myself on a woman; an inguinal hernia; about fifteen years ago. The hernia was cured, but the patient came back some months afterward and complained of pain in the groin. I made up my mind that a nerve was caught in a silk suture. I feel sure that in grasping the external oblique fascia I had gotten hold of the ilio-inguinal nerve or one of its branches. I grabbed her skin to the side of the pubes as firmly as I could (she was a lean woman), and then I said to her, "I am going to hurt you now." What I did to her caused her to yell unreasonably. I pulled downward and inward suddenly and the

nerve that was caught was apparently torn. I have seen the lady quite often since and she has not had any recurrence of the pain.

In the other case the same treatment also helped. I happened to be out in the country in consultation and after seeing our case I was asked to see a lady nearby that had been operated upon and who had since had a lot of pain. She had had a perineorrhaphy; I don't remember whether she had anything else done. Following the perineorrhaphy she had excruciating pain for several months on one side of the perineum. The pain was pretty well localized. I knew that surgeon had caught the perineal nerve with his suture; there was no question about it. After giving sufficient explanation I took hold of these parts, and then, with the other hand assisting, I yanked that area over to the other side and forward, and relieved her trouble. I have not heard from that case, but I know the surgeon who operated very intimately and he would have told me if she were not well. These two cases were handled by evulsion. The question in my mind is whether, after excision of these neuromata we have recurrences.

DR. ARTHUR T. MANN, Minneapolis: I think the first lesson we learn here is that we should use alcohol in all amputations. There is no question that alcohol has been used before for the injection of various nerves for pain, and when properly used it always gives quite a long period of relief, so that we have that as a criterion. The injection of the nerve and the recovery of the nerve stump show that it does prevent in a large measure the growth of these axones, and the neuromas they form.

In connection with the question of amputation or section of the nerve, whether we have a neuroma to deal with or not, it is purely an academic question, and it comes to the definition of the term of what a neuroma is. There is no question at all about the tissue in these so-called neuromas. They are of scar tissue and of the axones. They look like skeins of yarn. They, of course, lead to a great deal of trouble when attached to scars. They cause a great deal of pain. If the scars are attached to bone, when the other parts pull the bone holds it and the pain is enormous. When attached to muscle, the muscles pull and the sensation of pain is transmitted to the nerve centers, so that our first lesson is always in amputations to use carefully injections of alcohol, to prevent the formation of neuromatous growths, and that means 95 per cent alcohol and it must be given inside the nerve sheath. This is absorbed in the sheaths of Schwann if it is thoroughly and slowly given, so that the alcohol will infiltrate all part of the nerve and will dissolve them. The old method of cutting the nerve off away back from the amputation stump still holds good.

There are other painful situations which have been gone over very carefully by Dr. Corbett. His paper is very thoroughly and carefully prepared. If you read the paper very carefully you will find the things are all there and given in very simple language, and we can take our lesson from it.

In the soldiers who came back we found a great many of these neuromas. I have removed a large number and Dr. Corbett has taken out a large number. We have come to the conclusion from our experience that alcohol is our best application. A great many of these neuromas have recurred within six months or a year after they were taken out, and carefully taken out, without the alcohol, and I must say that I have had one recurrence after the injection of alcohol. We know in tic we get sometimes a recurrence of pain after a certain length of time after the injection of alcohol. Osmic acid has been used there as well as alcohol. We have not used osmic acid in these nerve tumors nor in the amputations. The latter gives longer relief in cases of tic where it has been used with the destruction of the nerve, but the alcohol certainly has served a very good purpose. As Dr. Corbett says, in at least 95 per cent of the cases we will get rid of the trouble.

In private life we have painful scars sometimes after any sort of operation, after an operation on the breast, after abdominal operations, and so on. We have pain in the legs and arms which is very difficult to diagnose. I have in mind one case that I saw last week. The patient is the wife of a millionaire. She has been babied a good deal; she has had pain in the leg for years, and she said the pain was so severe that she could hardly walk. She had an exceedingly good physician to take care of her. He searched for all focal infections and failed to find them. He searched locally for focal infection and failed to find it. She had a nurse with her for three months, and they were finally walking her two miles a day to get over this trouble which was undiagnosed, and it was thought to be functional of the hysterical order. One day, just as she was going up the steps, she fell, screaming with pain and said, "There it is, I can feel it." The nurse said to her, "Don't move," and the nurse got to the phone and telephoned for the doctor and it was found that what she had was a neuroma in the continuity of the nerve which had grown across the edge of the shin at the site of an injury. The neuroma was removed and the pain practically disappeared. However, she had some anesthesia down below, and she still has a little hyperesthesia. Alcohol should be used in this type of case too, at the time of the operation.

DR. J. C. MICHAEL, Minneapolis: I had occasion to examine a number of the cases Dr. Corbett has reported. From a neurological standpoint the symptoms are those of irritation of the sensory nerves. We find on examination hyperesthesia, hyperacute thermal sensibility, and increased pain sense, and also weakness of the muscles. Frequent trophic findings are hyperemia and hyperidrosis. The most important symptom is pain. The diagnosis should not be very difficult to make. There is, however a type of painful scar with which I am sure all surgeons

have become familiar in certain types of individuals. Some patients who get hit on the head or any part of the body may have pain at that location all the rest of their lives. Surgery done on this kind of individuals may be followed by localized pain, not, of course, of the same type as that from a neuroma, but less defined, less persistent type of condition constituting a neurosis. Here surgery should be looked upon as being the exciting cause just as we would look upon trauma as an exciting cause in the common case of traumatic neurosis.

I think Dr. Corbett's paper is of the greatest value to us, for the reason that he has pointed out not only the treatment of the neuromata as we find them but he has pointed out to the surgeon the method of prevention of neuroma formation.

DR. A. F. BRATRUD, Minneapolis: There is one type of scar we have seen that causes pain symptoms, but which the literature does not describe, and that is, where a person is hit in a very severe injury, a subcutaneous infiltration of the skin in some places of the scar. I have only seen one case, and I talked it over with Dr. H. E. Robertson. The scar in these cases is like a scar following a burn. There is pain under the scar. Dr. Robertson has had 7 cases of it, and in studying them he is of the opinion that it is a type of subcutaneous keloid. I am of the opinion that the keloid is in the skin only, but we were impressed with the fact that there was a subcutaneous keloid following injuries of the skin, particularly where there had been an abrasion of the skin.

Dr. Corbett hit the point exactly in one thing he said, namely, it is not a large nerve that produces the most trouble when associated with painful scars, but it is a small nerve.

DR. ROBERT EMMETT FARR, Minneapolis: It is a good thing for doctors to think of pain and the methods of relieving it. We pay too little attention to the question of pain and the suffering it causes our patients. It is perfectly natural that our patients should have some pain and they must go through it.

Dr. Corbett is entitled to great credit for calling our attention to such a definite method of preventing pain. I rise simply to mention two points, one the question of amplifying this method, which we have tried to do, where we have isolated them, with alcohol while we are doing any particular operation, especially a hernia operation. Authorities differ as to whether or not cutting the ilio-inguinal nerve and the ilio-hypogastric nerve will tend toward a recurrence of the hernia. I do not believe the injection of the nerve with alcohol will do so. We have made a perfectly painless post-operative course by this method. We have also used the method to prevent the various forms of paresthesia. I have injected 95 per cent solution of alcohol along the course of the nerve in cases of pruritus ani, and I find a small amount of alcohol will be tolerated.

With reference to these neuromata which occur in the stump in the upper arm or limb, I want to ask Dr. Corbett whether it would not be possible to block the brachial plexus and not make reamputation. I scarcely ever see one of these cases, but the men who are doing federal work see so many of them that the idea has occurred to me that it might be possible to block the brachial plexus slowly with alcohol, and thus avoid making a secondary operation. Would it not be worth while to try that?

DR. J. FRANK CORBETT, Minneapolis, (closing): I want to thank the gentlemen for their discussions. In regard to amputations I happened to be in one of the large military hospitals where a large number of amputations were done. I managed to get through an order that all nerves in amputations were to be injected with alcohol, and the day that was done you could see a difference in the postoperative pain and in the comfort of the patients. They had no postoperative pain, and you could go through the wards and pick out those men by the way they felt. I have done the same thing in civil life, and the immediate results, freedom from postoperative pain and a good clean stump were attained.

The question Dr. Schwyzer brought up I think is an important one. From what he said, it must be possible to either loosen a nerve or avulse it and relieve the pain. I have not tried this; as it did not seem to me that good results would come from avulsion. In cases of avulsion of the nerves that I have been called upon to operate on I found large neuromata. The only case of cut nerve, where there was no neuroma, was in a man whose arm was partially cut off by a buzz-saw, and I found the ends of the musculo-spiral nerve in the same condition they were at the time they were cut, and I do not know but what we are justified in using a buzz-saw to cut off our nerves.

There is another type of painful wound that is not relieved. I remember at one time I cut down upon what I thought was a painful neuroma and much to my surprise the nerve popped up. It was so bright red in color it could be seen across the room, and there was no neuroma, and no interruption of that nerve. In other words, in that case, I was dealing with some rare form of neuritis that I could not at the time explain.

The question of blocking the brachial plexus is a good one. At this point (indicating on the blackboard) in the upper arm we block the brachial plexus right above the clavicle. When you inject some alcohol in that place you have destroyed the sensation of every nerve that is below that point, but the sensation in the arm close to the body will not be interfered with. Therefore the sensation in a short arm stump will not be lost by injecting the brachial plexus at mid-point of the clavicle. Trophic changes occur if all the nerve supply is destroyed. In that case I believe it would have been a little more clever to have done as Dr. Farr suggested instead of taking each nerve individually.

In regard to blocking the ilio-inguinal nerve; Dr.

Muscovitz has done beautiful work on the ilio-inguinal nerve, particularly concerning the motor elements which supply the muscles concerned in hernia, and Dr. Farr is quite right in saying that it is an unsettled question whether destruction of the ilio-inguinal nerve will produce inguinal hernia or not. However, from the study that his man has made I am inclined to believe that sometimes destruction of the ilio-inguinal nerve may be followed by some motor paralysis that possibly might in some way influence the development of the hernia; but when we recollect the frequency with which hernia occurs in men of thirty-five years, (the percentage I think is something like five of all individuals) we must not jump at the conclusion that because we have some patients with a right rectus incision and cut ilio-inguinal nerve, that patient is going to develop a hernia.

I wish to thank you again for the discussion of my paper.

SOME PRACTICAL EXPERIENCE WITH INJURIES WITH SPECIAL REFERENCE TO FRACTURES*

C. W. More, M. D., F. A. C. S.
Eveleth, Minn.

Our work is such that we find it necessary to keep an account of every injury, however trivial, coming under our care whether at the hospital, office, or elsewhere. Records of this kind should furnish reasonably accurate statistics regarding the ratio of the various forms of injuries, that cannot be obtained from exclusive hospital or dispensary files.

In 1908, we reviewed 11,700 injuries occurring during the first fourteen years of our work at Eveleth and found that some part of the bony framework of the body was fractured 701 times or 6 per cent of the cases. There were 139 or 1.2 per cent dislocations; 195 puncture wounds of the feet caused by stepping on nails, etc. The head and face was injured 1,561 times, or 13.25 per cent; cerebral symptoms were observed in 39 or 2.5 per cent of these cases and there were 16, or about 1 per cent deaths, which includes every case that entered the hospital alive although the patient may have lived only a few minutes. Of the puncture wounds of the feet, 92 were on the right foot and 98 on the left, 5 not classified.

Our routine treatment in puncture wounds consisted of cleansing the skin, pushing a probe thinly covered with cotton and dipped in phenol to the bottom of the wound, followed by one dipped in alcohol, and applying a moist antiseptic dressing. In no instance was there an unfavorable result, although occasionally a mild cellulitis would develop which invariably subsided within a few days.

Table of dislocations (first series).

Shoulder	42
Elbow	16
Wrist	4
Hip	6
Knee	6
Ankle	14
Patella	1
Miscellaneous, as fingers and toes	37
Clavicle	9
Vertebrae	4

(Of the dislocations of the extremities, not including the fingers and toes, 57 occurred on the left side and 41 on the right side).

Of the 139 dislocations, 106 were closed, 4 compound, 27 closed dislocations with fractures, and two compound with fractures.

Table of Fractures (First Series).

	Total	Closed	Open	Right	Left	Upper Ext.	Lower Ext.
Skull	41	14	27	...	...	...	...
Face	42	25	17	...	...	...	...
Extremities*	596	494	102	324	252	297	299
Trunk, as ribs spine, etc.	114	...	...	...	...	...	...
	793						

(We have a memorandum of 92 additional fractures which were recorded before we commenced to keep a list of all injuries, making a total of 793.)

There were 494 closed fractures and 102 open fractures of the extremities, exclusive of crushing injuries of which there were 195. Of the crushing injuries, 148 occurred in the upper extremities and 47 in the lower. Fractures of the upper and lower extremities were almost equal in frequency, 297 and 299. Fractures occur in every conceivable form.

Since the above report was made we have reviewed 21,100 additional injuries to give these statistics. In this second series there were 1,334 or 6.32 per cent fractures, not including crushing injuries. Nearly all of these have been con-

*Presented before the Minnesota Academy of Medicine, St. Paul, April 1921.

*Side not specified in 20.

firmed by x-ray examination. There were 109 injuries diagnosed as possible or probable fractures not confirmed by x-ray and therefore not included in this report. In fact a radiographic examination is made of every injury in which there is a possibility of fracture either from cause or symptoms.

(See Tables.)

CHART A

	Right	Left	Both	Side not given
Skull:				
Closed	5	10		36
Closed comminuted	-	1		1
Compound	2	1		4
Compound comminuted	-	1		2
Totals	7	13		43

(Of the above 5 were combined with other fractures.)

Ages:
To Ten.... 7
Teens 0
20's 18
30's 21
40's 6
50's 1
60's 1
70's 1
? 8
63

	Right	Left	Both	Side not given
Jaw:				
Closed	5	2	1	2
Compound	-	4	-	-
Totals	5	6	1	2

(Of the above 4 were combined with other fractures.)

Ages:
To Ten.... 2
Teens 1
20's 3
30's 4
40's 3
50's 1
14

	Right	Left
Malar:		
Closed	-	1
Compound	1	-
Zygoma:		
Closed	-	1
Total Malar and Zygoma	1	2

(Of the above none were combined with other fractures)

Ages:
28 and 33 years.

Age:
31

Nose:
Closed 21
Closed Comminuted 1
Compound 7
Total 29

(Of the above 4 were combined with other fractures)

Ages:
To Ten.... 2
Teens 7
20's 11
30's 3
40's 6
29

TOTAL number of fractures of the head 109

CHART D
SUBDIVISIONS OF FRACTURES OF UPPER EXTREMITIES (Continued)

	Right	Left	Both	Side not given
Humerus:				
Closed	44	38		2
Closed Comminuted	2	3		-
Compound	1	-		-
Compound Comminuted	1	1		-
Totals	48	42		2

(Of the above 20 were combined with other fractures)

Ages:
To Ten....47
Teens 19
20's 6
30's 8
40's 3
50's 4
60's 1
70's 1
(Children)
? 3
92

	Right	Left	Both	Side not given
Hand:				
Closed	23	16		3
Closed Comminuted	-	1		-
Compound	2	5		-
Compound Comminuted	-	1		-
Totals	25	23		3

(Of the above 3 were combined with other fractures)

Fingers:				
Closed	37	30		5
Closed Comminuted	6	3		-
Compound	26	21		4
Compound Comminuted	6	2		-
Totals	75	56		9

(Of the above 3 were combined with other fractures)

To Ten....10
Teens 17
20's 62
30's 54
40's 32
50's 6
60's 2
70's 1
? 7
191

Unclassified 6
Total number of fractures of upper extremities 532

CHART B
SUBDIVISION OF FRACTURES OF THE TRUNK

	Right	Left	Side not given
Scapula:			
Closed	9	7	
Closed Comminuted	-	1	
Totals	9	8	

(Of the above 8 were combined with other fractures)

Ages:
To Ten....
Teens 2
20's 2
30's 6
40's 3
50's 3
? 1
17

	Right	Left
Clavicle:		
Closed	46	54
Closed Comminuted	2	1
Totals	48	55

(Of the above 7 were combined with other fractures)

To Ten....46
Teens 17
20's 16
30's 10
40's 6
50's 7
60's 2
? 5
103

	Right	Left	Side not given
Ribs:			
Closed	47	43	21
Closed Comminuted	-	1	-
Totals	47	44	21

(Of the above 8 were combined with other fractures)

To Ten.... 1
Teens 3
20's 20
30's 26
40's 33
50's 18
60's 2
70's 2
? 7
112

Spine:
Closed 8
Closed Comminuted 1
Totals 9

(Of the above 2 were combined with other fractures)

20's 6
40's 2
50's 1
9

Pelvis:
Closed 8
Total 8

(Of the above one was combined with other fractures)

To Ten.... 1
20's 5
30's 1
40's 1
8

TOTAL number of fractures of the trunk 249

CHART C
SUBDIVISION OF FRACTURES OF UPPER EXTREMITIES

	Right	Left	Side not given
Ulna (alone):			
Closed	18	14	
Closed Comminuted	1	1	
Compound	-	-	
Compound Comminuted	-	3	
Totals	19	18	

(Of the above 10 were combined with other fractures)

Ages:
To Ten....11
Teens 12
20's 4
30's 2
40's 1
50's 3
60's 1
? 3
37

	Right	Left	Side not given
Radius (alone):			
Closed	32	31	3
Closed Comminuted	-	5	-
Compound	1	-	-
Compound Comminuted	-	1	-
Colles	43	22	3
Totals	76	59	6

(Of the above 8 were combined with other fractures)

To Ten....22
Teens 23
20's 19
30's 27
40's 24
50's 8
60's 4
? 8
141

	Right	Left	Side not given
Radius & Ulna:			
Closed	27	32	4
Closed Comminuted	-	1	-
Compound	-	-	-
Compound Comminuted	-	1	-
Totals	27	34	4

(Of the above none were combined with other fractures.)

To Ten....32
Teens 21
20's 5
30's 4
40's 2
? 1
65

CHART E
SUBDIVISIONS OF FRACTURES OF LOWER EXTREMITIES

	Right	Left	Side not given	Ages:	
Tibia (alone):					
Closed	24	16	1	To Ten	28
Closed Comminuted	4	4	-	Teens	12
Compound	-	1	-	20's	15
Compound Comminuted	4	4	-	30's	7
Malleolus	5	5	-	40's	4
				50's	1
Totals	37	30	1	60's	1
(Of the above 4 were combined with other fractures)					68
Fibula (alone):					
Closed	20	21	1	To Ten	2
Closed Comminuted	3	-	-	Teens	3
Compound	3	-	-	20's	13
Compound Comminuted	-	-	-	30's	16
				40's	8
Totals	26	21	1	50's	2
(Of the above 8 were combined with other fractures)				60's	1
				?	3
					48
Tibia & Fibula:					
Closed	25	16		To Ten	5
Closed Comminuted	7	7		Teens	6
Compound	4	5		20's	31
Compound Comminuted	6	4		30's	27
Pott's	10	12		40's	17
				50's	7
Totals	52	44		60's	2
(Of the above 6 were combined with other fractures)				?	1
					96

CHART F
SUBDIVISIONS OF FRACTURES OF LOWER EXTREMITIES (Continued)

	Right	Left	Side not given	Ages:	
Femur:					
Closed	23	18	2	To Ten	28
Closed Comminuted	2	3	-	Teens	6
Compound	2	1	-	20's	12
Compound Comminuted	1	-	-	30's	4
Trochanter	5	6	-	40's	7
				50's	2
Totals	33	28	2	60's	1
(Of the above 8 were combined with other fractures)				70's	1
				?	2
					63
Patella:					
Closed	4	2		20's	3
Closed Comminuted	1	-		30's	2
				40's	2
Totals	5	2			7
(Of the above one was combined with other fractures)					
Foot:					
Closed	23	23	5		
Closed Comminuted	2	2	-		
Compound	1	1	-		
Compound Comminuted	1	1	-		
Totals	27	27	5	To Ten	2
(Of the above 8 were combined with other fractures)				Teens	8
				20's	50
Toes:				30's	49
Closed	39	31	3	40's	26
Closed Comminuted	5	4	-	50's	12
Compound	2	7	1	60's	3
Compound Comminuted	6	3	-	?	10
Totals	52	45	4		160
(Of the above 4 were combined with other fractures)					
Unclassified			1		
Total number of fractures of lower extremities			443		

CHART G
SUMMARY OF FRACTURES

	Fractures		Probable Fractures (1 fatal)
Head:			
Skull	63	(30 fatal)	10
Nose	29		1
Jaw bones	14		2
Malar Bones & Zygoma	3		3
Totals	109		16
Trunk:			
Scapula	17		2
Clavicle	103	(1 fatal c other inj)	4
Ribs	112	(2 fatal c other inj)	25
Spine	9	(7 fatal)	0
Pelvis	8	(1 fatal—Embolism(	1
Totals	249		32
Upper Extremities:			
Hand	191		15
Ulna (alone)	37		15
Radius (alone)	141		2
Radius & Ulna	65		9
Humerus	92		1
Unclassified	6		1
Totals	532		33
Lower Extremities:			
Foot	160		16
Tibia (alone)	68		4
Fibula (alone)	48		2
Tibia & Fibula	96	(3 fatal)	-
Patella	7		-
Femur	65	(3 fatal)	-
Unclassified	1	fatal c other inj)	7
Totals	443		30
Recapitulations:			
Head	109		16
Trunk	249		31
Upper Extremities	532		33
Lower Extremities	443		30
Totals	1333		110

By referring to the tables, we find children ten years of age and under received:

51 per cent of all fractures of the humerus including elbow.

49 per cent of radius and ulna.

44 per cent of clavicle.

44 per cent of femur.

41 per cent of tibia alone.

30 per cent of ulna alone.

Of the fourteen dislocations of the hip, eleven were on the left side and three on the right. All hip dislocations were readily reduced by manipulation under anesthetic, except one downward and inward in which manipulation was unsuccessful and I felt obliged to resort to the pulley.

The diagnosis of fractures may be easy, difficult, or sometimes impossible without the x-ray. Given a case with a history of injury by direct violence with tenderness on deep pressure at some point over the bone as the only evidence of injury, a split or crack in the bone is frequently found by making a number of x-ray exposures at different angles as emphasized by Dr L. E. Daugherty. (Fig. 1).

It may not be amiss here to mention an anatomical condition that is occasionally mistaken for a fracture. The shaft of the fibula can be only indefinitely palpated, except at its lowest

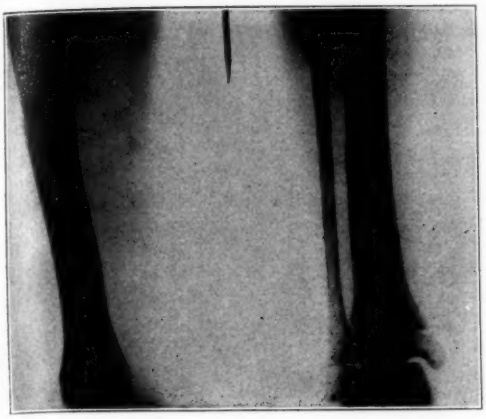

Fig. 1

fourth where it becomes subcutaneous. About four inches above the lower end of the fibula, there is a depression and just below it an apparent bony prominence suggesting a fracture with the upper end of the lower fragment riding outward. To add to the deception, continuous firm pressure in the depression causes pain. This condition can be demonstrated on almost any one, but it is more prominent in some than in others. An examination of the skelatal fibula does not fully account for the condition found on the living subject.

For many years the treatment of fractures has been neglected by our surgeons in civil practice. Of late there has been much written and said on this important subject, and it is interesting to watch the methods of fracture treatment.

My results in the treatment of fractures vary, of course, depending upon many circumstances. With a desire to improve them, I, optimistically at first and skeptically later, have tried some of the suggested methods with still varying success. My failures may have been due to faulty technique; but I am more convinced than ever that a sane and common-sense application of the laws of physics and mechanics is necesary, rather than the attempted use of some new device without a reasonable understanding of anatomy and what is required to secure good functional results; remembering that "Any variation in the pressure or change in the mode of transmission through a joint results in an alteration in the form of that joint."[2] And in the treatment of fractures extreme care must be taken to prevent any variation in the normal anatomical relations of the articulating joint surfaces. As Dr. Jones concisely states: "Restoration of function is the all important thing", and the better the anatomical restoration, the better the functional result. "If we cannot always secure end to end apposition, there can be no difficulty even with the most primitive means in securing correct alignment in most cases."[2]

Fractures of the lower third of the bones of the leg are among the most difficult with which we have to contend; and in oblique or comminuted fractures of the tibia without fracture of the fibula, perfect alignment that will preserve the normal joint relationship can be seldom obtained without an open operation.

Case I. **Louis A., age 37. July 29, 1918. Comminuted fracture of left tibia lower fourth. Perfect reduction impossible. Open operation refused. Union slow with some shortening of the tibia, which interfered with the normal relationship of ankle joint. Patient was in the hospital five months and twenty-five days. Total disability over two years. (Fig. 2. A. B. C. & D.)**

Fig. 2 A

Of course everyone who has much to do with fractures realizes the importance of bringing the foot up to right angle with the leg (unless there is some strong indication to the contrary) when it is necessary to encase the foot and leg in plaster of Paris. Failure to do so increases the disability from one to three months, that length of time usually being required before the joint regains its full motion.

Frequent inspection and comparison with the

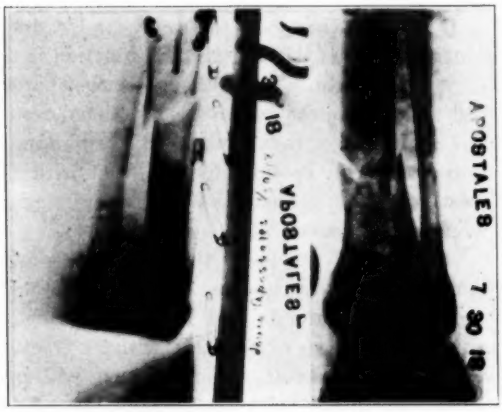

Fig. 2 B

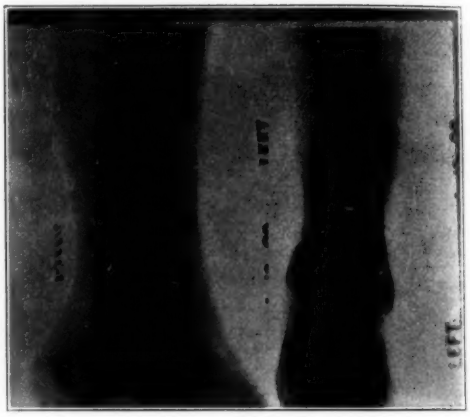

Fig. 2 D

sound limb is of much value and should not be neglected.

Thirty years ago I was taught to use the Hodgen's Extension suspension apparatus in fractures of the tibia and fibula, and have used it more or less ever since. My results from its use have been better than by any other method. It permits of extension, lateral traction and suspension in any position desired. It is comfortable for the patient and allows frequent inspection. So much has been written and said about the Hodgen that I hesitate to add anything further, but the following has proved of some value to me:

In oblique fractures of the tibia in which extension does not hold the laterally displaced fragments in position, I find that placing a strip of adhesive around the leg over the end of the displaced bone and attaching the ends of the plaster to the opposite bar of the Hodgen, and placing another one around the leg on the opposite side and attaching it to the other bar produces lateral and counter-lateral traction. This together with complete extension holds the bones in position.

If one end is inclined to ride forward, a thick pad is placed over it and held down by a thin strip of board passed under each bar of the Hodgen, thus holding the fragments down firmly. The pad can be moved up and down daily as required to avoid pressure sores.

The Hodgen has many possibilities and it requires some knowledge of mechanics to get the full benefit of it. In fractures of the femur, we have used the Hodgen or double incline plane occasionally, and lately the Thomas hip splint; but more often in our earlier experience Buck's Extension with coaptation splints and a Hamilton long side splint, strictly in accordance with Hamilton's method. To prevent the foot and leg from rolling outward, one or two adhesive strips are placed over the bandage commencing at the inner side of the leg, passed under it and up on the outer side of the long side splint, drawn snug and fastened, thus holding the leg in good alignment. Boards are placed under the mattress if it is inclined to sag in the center. This is imperative.

Good functional results were obtained in the majority of cases; a few had permanent deformity; some were operated. This method is not adapted to all cases.

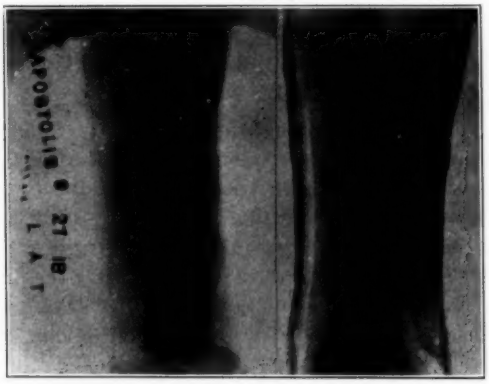

Fig. 2 C

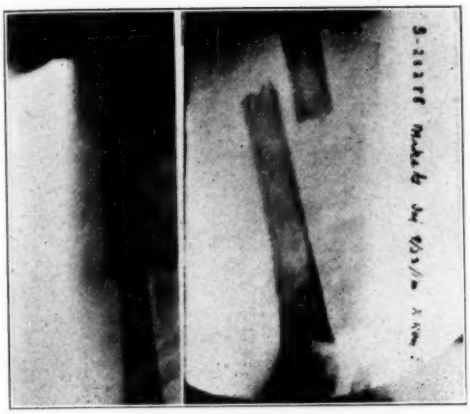

Fig. 3 A

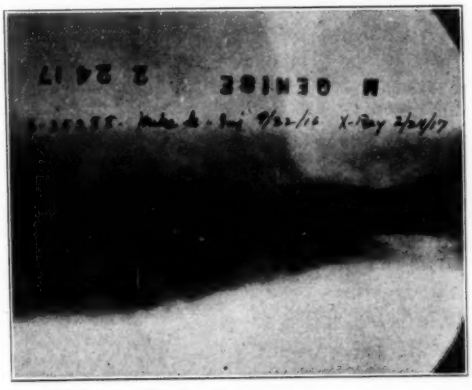

Fig. 3 B

After the x-ray came into use, we operated more frequently, using wire and, later, steel plates. Two wires were used, one passing antero-posteriorly and one laterally. The application of wires is a little more difficult than plates and perfect alignment is not so easily obtained but infection is less likely to follow the use of the former. Given a case where skillful attempts at reduction are unsuccessful, with proper surroundings, a surgeon with experience and technical knowledge, the consent of the patient, etc., we still have another important factor to consider—the patient's general condition.

Case II. Mike G. Sept. 22, 1916. This well developed lad aged eight years, received a transverse fracture of the shaft of right femur about the middle third with considerable displacement and 1.5 inch shortening. Under anesthetic an attempt was made to bring the fragments into apposition and the leg was dressed with Buck's extension by Hamilton method. The weight over the pulley was fifteen pounds. The following day measurements and x-ray examination showed that the extension was nearly complete but the position of the fragments was little improved. The patient complained of pain in the fractured leg, was restless, and his temperature was 99 to 102 for about ten days. Three days later, thirteen days after the injury, the boy's general condition was apparently good and an open operation was done. The usual free incision was made and, as we were attempting to pull the fragments into place by means of bone forceps, free, moderately thick pus poured out from a pocket on the inner side of the leg. However, a four-screw plate was applied and two bronze aluminum wires passed around the plate and femur to hold the plate in place in case the screws became loose. Rubber drains were placed through stab wounds and the incision closed. On April 23, 1917, the condition of the leg was good with the exception of a discharging sinus. The plate and some fragments of dead bone were removed. He left the hospital May 13, 1917. The wound was closed. The result was very satisfactory—no shortening, good alignment and function. (Figs. 3, A & B).

We have been advised not to operate before seven to fourteen days after injury unless we can operate within the first few hours. If we had operated earlier and this infection had occured (as it presumably would have occurred) we would have criticized ourselves for faulty technique. In this case, the pain and elevation of temperature for ten days were accounted for at the operation.

Microscopical examination of smears taken from the deeper parts of the wounds made in subsequent open operations for fractures have so far been without positive findings.

Case III. James F, age 30. Transverse fracture of the right femur about the middle third; shortening 1.75 inches; also a fracture of the inferior

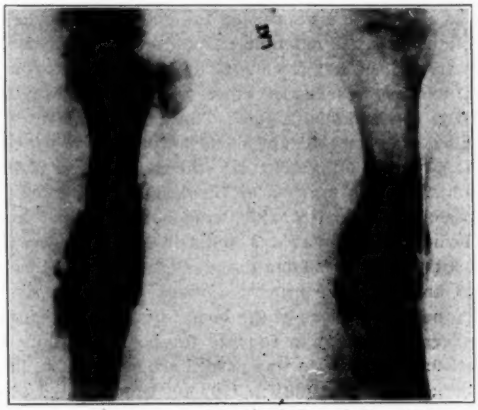

Fig. 4

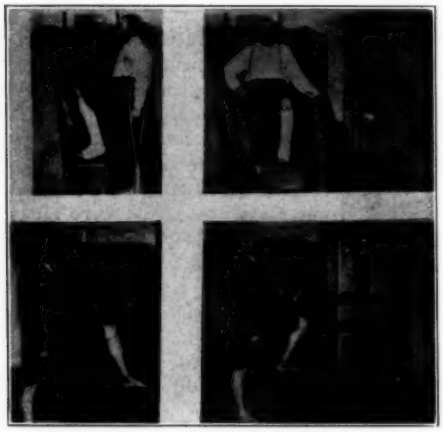

Fig. 6. A B C & D

maxillary and crushing injury to all fingers of the left hand. The fingers were amputated; the jaw was placed in position and easily held by wires passed around the teeth; a Thomas hip splint was applied to the broken femur. Complete extension was accomplished, but the fragments could not be manipulated into position under anesthesia. A Lane plate was applied. A small projection of bone on the anterior surface of the lower fragment, which was resting behind the upper fragment, had penetrated the fascia, and it was with great difficulty that the bones were brought into correct position, the gloved fingers being inserted into the wound a number of times. Primary union had apparently taken place. Later the patient began running a temperature and pus was encountered. At the time of operation, there was an abscess of the soft parts around the fractured jaw. It is a question whether the infection in the femur was due to deficient asepsis or to the infection around the teeth, or to both. (Fig. 4.)

Case IV. John B, age 43. March 12, 1919. Patient was bowling and slipped on the floor. There was an oblique fracture extending from the lower posterior portion of the left trochanter downward and forward. Intoxicated; consumes large quantities of whiskey daily. General health good. The upper fragment was pulled well forward and could be easily felt beneath the skin and fat. Ether anesthesia produced violent clonism of all muscles of the body. Reduction impossible and April 4, 1919, open operation was done. The upper fragment was found to be pulled forward about three inches from the lower fragment and could not be pushed or pried backward sufficiently to be grasped in the jaws of the bone forceps. The gloved fingers were used to squeeze the bones partially together, while a wire was passed around them to hold them temporarily until a Parham band could be applied and a nail driven in. Primary union followed.

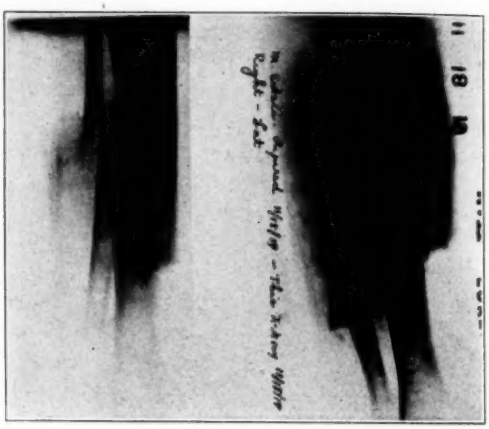

Fig. 7 A

June 7th the cast was removed. The patient was intractable and would bear considerable weight on the leg. On June 18th, he insisted on leaving the hospital and refused further treatment. The leg was 0.4 inches short. June 22nd, he was walking the streets using crutches, bearing considerable weight on the leg and had some stiffness of knee. A short time later he was walking without crutches.

Freshly mined iron ore and dirt deep underground is sterile. Crushing injuries and compound fractures occurring underground are seldom infected, but the treatment, of course, must be conducted with perfect asepsis.

In compound fractures where the bones are protruding through the skin the wound is protected by a wet antiseptic pad, and the leg is thoroughly washed and shaved. The left hand grasps the leg with the thumb and fingers on each side of the wound and by drawing and sliding the fingers toward the wound on the skin,

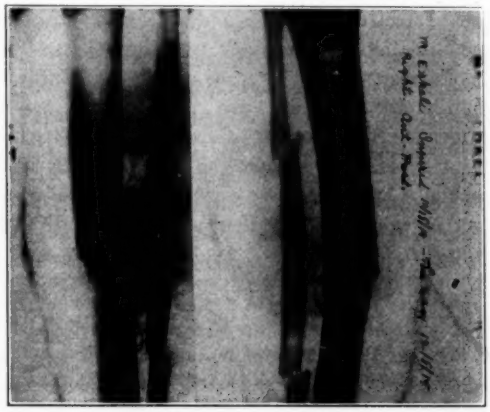

Fig. 7 B

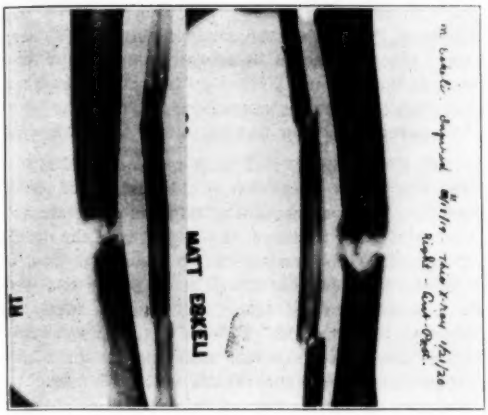

Fig. 7 C

clots of blood, dirt, etc., are squeezed out. The left hand is not released until the fingers of the right hand have grasped the leg in a similar manner and have been brought as close to the wound as possible, thus preventing any suction carrying possible infection into the deeper parts of the wound. This process is repeated until nothing further comes away. After which the fracture is reduced and the wound is dressed in the usual manner and in the majority of cases encased in plaster of Paris, with or without extension.

Case V. Anton M., age 58. June 11, 1898. Compound dislocation of right ankle, protrusion of the inner malleolus through a large open wound, and a comminuted fracture of right fibula. The patient was seen forty-five minutes after the accident. The leg was prepared as above described; the dislocation reduced; the wound partially closed and dressed with the foot inverted and held

Fig. 7 D

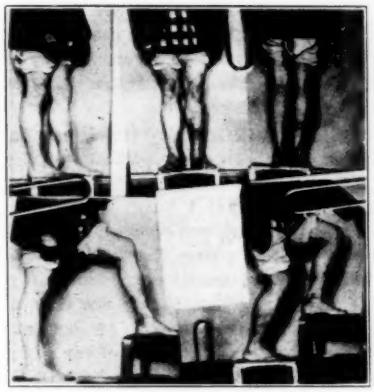

Fig. 7 E

at right angle to the leg; a plaster of paris cast was applied. The wound was dressed occasionally and a new cast applied each time, the leg being held in the same inverted position during the entire process. He was discharged July 30th. He walked without the aid of crutches or cane; had perfect motion in ankle; returned to work Aug. 21st, or two months and ten days after the injury. (Figs. 6, A. B. C. & D.)

Case VI. Matt E., age 49, farmer. Nov. 18, 1919, the automobile in which he was riding was struck by a railway passenger engine. He sustained fractures of the hand and shoulder, numerous cuts and bruises, a crushing injury to the soft parts of the right leg with a fracture of the tibia and multiple fractures of the fibula. The skin was intact, except an opening about one inch in diameter in the leg. This was plugged from the inside by torn muscle which prevented the escape of blood. The leg was very much distended. Amputation was considered and decided against. Without enlarging the wound, large quantities of blood, pieces of bone and torn muscle were squeezed out. The leg was dressed and a cast applied, so arranged as to permit frequent dressings. There was some discharge of serum, necrotic tissue, and pieces of bone from the wound; later some small pieces of necrosed bone, but there was no active infection. About Dec. 11th the leg was placed in Hodgen with extension, which was not permissible before. On April 21st, the patient was allowed to go home. By June 22nd the wound had nearly healed and he was walking without crutches, with good union and alignment. (Figs. 7, A. B. C. D. & E.)

REFERENCES

1. L. E. Daugherty, "Fractures of Head of Radius", Journal of Minnesota Medicine, September, 1919.
2. Arbuthnot Lane, "Operative Treatment of Fractures."
3. Robert Jones, Liverpool Medical & Surgical Journal.

DISCUSSION.

DR. DENNIS: I feel that we are very fortunate to have this paper by Dr. More. Perhaps very few men in the United States have had a wider experience along this line than Dr. More.

DR. L. E. DAUGHERTY: It was my privilege to be associated with Dr. More. The hospital which Dr. More has in Eveleth is small but the most completely equipped hospital that I have ever seen. The hospitals in St. Paul are not properly equipped to treat fractures. This is partly the fault of the surgeons who do not demand proper equipment.

These statistics of Dr. More's are very interesting and I know they are accurate. My own statistics in fractures are very poor in spite of my early training received from Dr. More and later from Dr. MacLaren. The Hodgen splint as used by Dr. More is extremely useful in fractures of the tibia and fibula. This was used during the war, but at the time Dr. Moore was using it 30 years ago I do not believe it was used for this purpose very much.

So many of the dislocations in these cases occurred in the left hip. I think I can explain this. Many of these miners work under-ground and many are injured by cave-ins. They work with the right foot extended and the left hip back, and when a cave-in occurs as they are thrown to the ground they give a twisting motion and fall to the left. This may account for the majority of dislocations in the left hip.

DR. H. B. SWEETSER: I would like to ask Dr. More, in injuries in that part of the country, what number of cases of tetanus he encounters. Here we would expect to get more or less cases of tetanus and use anti-tetanus serum.

A man was brought to us who had an un-united fracture of the femur. The x-ray showed overlapping bones and pieces of bone detatched. Operated on 3 months afterward and found abscess surrounding the bone which the x-ray had not shown. Took out piece of bone and put the fracture in alignment. Put splint on and, with no drainage, wound healed absolutely perfectly. He had a firm union at end of 2 months.

DR. A. MACLAREN: The Academy of Medicine is very fortunate in having such a paper as Dr. More has presented, because there are very few men in the United States who have had such a wide experience with fractures as Dr. More has had. There are only a few surgeons in Dr. More's class. Dr. W. L. Estes of So. Bethlehem, Pa., who has most of the mining accidents of the Pennsylvania mine fields, and who has been Chairman of the Section on Fractures of the American Surgical Association for many years, is, I believe, the only man who has had as much experience as Dr. More.

Having served a long apprenticeship in the mechanical treatment of fractures Dr. More, who as I know is a very conservative surgeon, now reports quite a number of very interesting operations on fractures. What is the proportion of bad fractures which in his judgment should be operated upon? There has been such an operative furor by surgeons of almost no experience that today the student thinks that almost every fracture should be operated upon. Our experience at the University Hospital is that of seeing many bad results following operations on fractures by men who never knew how to treat a fracture with splints.

DR. EMIL GEIST: I wish to thank Dr. More. I was very much impressed by the number of children involved and was beginning to wonder whether they had child labor up there. I am glad that the question of operative and non-operative treatment has been brought up. The question of metal plates and wiring is a moot question today and a good many have dropped that method. I think with the gradual removal from the surgical armamentarium of steel plates and screws our results will be better. I am glad that Dr. More reported Dr. Jones dictum that the better alignment we get the better functional results we are likely to get.

DR. ARCHA WILCOX: The subject of fractures necessarily always brings forth discussion. I have known of Dr. More's work for some time and shall look forward to the published tables and reports so that I may have a chance to study them.

The personal application of enthusiasm in the treatment of fractures tends to swing the pendulum towards conservative treatment in place of operative treatment.

I divide the responsibility in fractures into three classes: 1. the responsibility of the surgeon; 2. the responsibility of the hospital; and 3, the responsibility of the patient.

A patient wants to see his x-ray and I don't know how you are going to keep him from doing it. He may be distrustful and begin to argue about the treatment; he doesn't know much about function and alignment. I think certain propaganda should come from the profession for the purpose of changing the layman's point of view in this field.

In regard to the responsibility of the hospital, Dr. Daugherty took the words out of my mouth. Few hospitals are equipped for the treatment of fractures. A specialist in this line must have a workshop. In addition to this, space in the hospital should be given to a group of men who are particularly interested in fractures.

DR. MORE, Hibbing, (in closing): So many kind things have been said that I would feel highly flattered if I did not have my share of bad results in fracture cases staring me in the face. When Dr. Daugherty was associated with me his interest and enthusiasm in the treatment of fractures was a source of gratification, because I soon found I could leave the care of these cases to him.

Answering Dr. Sweetser's inquiry, I have never seen a case of tetanus on the range.

I have gone to Dr. McLaren with my problems on a number of occasions and have always been well advised; and I am sorry that I cannot tell him what proportion of bad fractures we have operated

upon. To operate upon the bad cases in which a reasonably good function cannot be expected by the closed method, and some of our worst results have been in these cases.

I appreciate Dr. Geist's suggestion regarding metal plates and wire. We have very little child labor on the range, and none for children under ten years of age to which my tables refer. The cause of fractures in children is principally from falls and automobiles.

Dr. Wilcox refers to the x-ray. It is our rule to show the patient his x-rays taken before and twenty-four hours after putting up the fracture, and all later x-rays. We take the patient fully into our confidence and tell him frankly and honestly what we think about it. He understands it better and seems more resigned if we tell him that a broken leg is a mended leg, etc. We use no camouflage. The only promise we make is that we will do the best we can; and we keep our promise.

In regard to tetanus, I don't think I ever was a case of tetanus on the Range. Dr. Daugherty overestimated my work in fractures and he took to fractures like a duck to water. We see constantly so many cases of fractures that we get tired of them. It is lots of responsibility. Eternal vigilance of fractures becomes tiresome.

I find the best way is to show the patient the x-ray and explain it to him and follow it right through. If we have to operate we show him why and explain that to him. Generally patients are better satisfied to be shown the x-ray plates and we get better results.

I have not looked up the proportion of cases in which we operate.

CYSTOCELE AND PROLAPSE*

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The uterus and bladder are supported by an upper and a lower musculo-membranous plane or diaphragm. In the upper plane the uterus is supported laterally by the broad ligaments, posterity by the utero-sacral ligaments and anteriorly by the utero-pubic fascia plane which also supports the bladder. The spaces between the ligaments are filled by fibres passing from the uterus to the pelvic walls, thereby completing the upper diaphragm which is lined above by peritoneum and is perforted by the urethra, cervix and rectum.

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The round, utero-sacral and lower portion of the broad ligaments contain a considerable amount of plain muscle together with strong connective tissue. This strong musclo-fibrous tissue in the lower portion of the broad ligaments is known as the perimetrium; it is a most important support for the uterus, vagina and bladder and maintains the pelvic organs in their relative positions The lower plane or diaphragm may be divided into two diaphragms, the levator ani and the urogenital.

The levator ani with its rectovesical fascia above and its anal fascia below supplemented by the urogenital muscles in front and the coccygeus behind is the main supporting foundation which reinforces and supplements the upper diaphragm in retaining the pelvic organs at their proper levels. There are three openings through this lower musculo-fibrous plane:

1. The urethra which is well protected because it opens in front under the pubic arch.

2. The rectum behind which is well-protected because of the obliquity of its canal and the protection from its sphincter ani muscle.

3. The vaginal opening which is the weak point in this area.

Under normal conditions the vagina is also fairly well protected by virtue of its being placed well forward out of the line of direct pressure. The direction of the vaginal canal is such that intra-abdominal pressure tends to close the canal. When the uterus occupies its normal anterior position it serves as a cover for the upper end of the vagina; in addition the intra-abdominal pressure is received upon its broad posterior surface and distributed over a wide area of its supporting planes. As the intra-abdominal pressure pushes the uterus further down it closes tighter the vaginal canal and pushes the cervix further back, thereby putting the vaginal walls on a stretch, making protrusion still more difficult. When the uterus occupies its normal anterior position it may protect the vaginal opening even though the opening has been considerably enlarged and weakened.

The levator ani does not really elevate the anus. As its fibers practically surround the vagina and rectum, these openings are pulled

forward toward the symphsis when the muscle contracts.

The levator ani muscle is really an abdominal wall muscle and contracts synchronously with the other abdominal wall muscles; if it did not, the perineum would bulge down when the diaphragm and other abdominal muscles contract, and the pelvic contents would be pushed out.

The anterior part of the pelvis is closed by the urogenital diaphragm which crosses at right angle to the levator ani and is anterior to it. It does not extend as far back as the rectum. Its function is to close the hiatus so that the organs will not be prolapsed during defecation.

If the abdominal cavity were filled with air, the pressure would be the same on all its walls, but as the abdominal cavity is filled with organs which have the same weight as water, we have hydrostatic pressure; therefore, when the body is in the erect position, the pressure is at the bottom and tends to push the pelvic organs out.

When the uterus is in anteversion, the line of pressure on the posterior surface of the uterus is deflected against the most resisting portion of the pelvic floor—the tendinous perineum. In retroversion the long axis of the uterus and vagina tend to coincide, in which condition the intra-abdominal pressure can more easily push the uterus out of the relaxed vaginal orifice.

The supports of the uterus are: peritoneum, arteries, veins, nerves, ligaments, fascia, pelvic floor muscles, fat and skin.

That the peritoneum cannot hold the uterus in position against the abdominal pressure is shown by hernias, where we have a fight between the peritoneum and abdominal pressure.

That the arteries, veins and nerves cannot hold the uterus in position is shown by a floating kidney, spleen and other loosened organs in which condition we have elongated arteries, veins and nerves.

The ligaments are the round, board, utero-sacral and utero pubic. The round ligaments are curved, they are never straight, and are not normally tense. If a forcep is put on the cervix and the uterus is pulled down and out, the round ligaments will not become tense. They therefore cannot be suspensory ligaments and do not hold the uterus from prolapsing, but they do hold it in anteversion.

Alexander's operation will not cure prolapse, but it will cure retroversion if the pelvic floor muscles are intact.

The utero-sacral ligaments are also said to hold the uterus in position. They form part of Douglas' Pouch and become firm and tense when the uterus is pulled down. They are suspensory ligaments, containing muscle fibers which stretch from continuous pull. These ligaments help to hold the uterus in anteversion by pulling the cervix backward.

The muscle fibers of the round, utero-sacral, and broad ligaments and of the utero-pubic fascia, are of the same type as the uterine muscle and have the same enervation and act synchronously with it. During labor the uterus tends to go up into the abdominal cavity. Beside holding the uterus in anteversion, the main function of the round and utero-sacral ligaments is to hold the uterus down during labor contractions, being aided by intra-abdominal pressure.

The broad ligaments are composed of peritoneum, some plain connective tissue, muscle fibers, blood vessels, nerves and fat, all of which will gradually stretch under tension and are therefore usually not capable of preventing the uterus from prolapsing unless supported by the levator ani.

The utero-pubic fascia is often the first to give way, permitting the beginning of a cystocele, especially when the uterus is retroverted or the fascia has been damaged during childbirth.

There is still a controversy as to just what role the ligaments play in preventing prolapse. Although they do, no doubt, controbute to a considerable extent in supporting the pelvic organs, it seems quite reasonable to suppose that one of their main functions is to limit and accommodate the relative positions of the pelvic organs in their various functions so that as one fills or empties, the space it takes up may be compensated.

The perimetrium, by its firm attachment to the cervix and vagina holds the upper part of the vagina in place and keeps it from prolapsing. The uterus is a movable organ; it can be moved into anteversion or retroversion; it can be pushed up or pulled down. Under normal conditions, if the perineum is held back with a

retractor the cervix and upper part of the vagina can be easily pulled down to the vulva with a volsella even though there be no prolapse. The organs will return to their normal positions as soon as traction is relieved. We see patients with a marked cystocele with or without an elongated cervix and with a large patulous vaginal orifice, in whom there is no prolapse of the body of the uterus due to unusually strong broad and utero-sacral ligaments, or fibrous thickening and shortening of the pelvic connective tissue caused by pelvic infection.

With rare exceptions an enlargement of the vaginal aperture is a constant accompaniment of prolapse of whatever degree. A stretched vaginal orifice is occasionally seen without a prolapse; it is then frequently associated with bearing down pains and a sensation as if something was coming out. This is the warning that the unsupported uterine ligaments feel they are beginning to stretch and give away.

Prolapse does not take place when the uterine ligaments are normal and intact. When, as a result of childbirth, the lower supporting foundation or diaphragm is lacerated or stretched sufficiently to be thrown out of its normal relations the pelvic ligaments which have also undergone more or less stretching, are often unable to maintain the organs in their normal relations so that more or less prolapse takes place. Stretching or laceration of the vaginal aperature is therefore the greatest predisposing cause of prolapse and anything which increases the intra-abdominal pressure is an aid.

Prolapse occurring in nonparous women must be explained on the ground of disease or injury to the nerves supplying the muscles in either or both the upper and lower planes of pelvic supports, or to some congenital defect or atrophic disease of these supports.

In spinabifida or any other disease or injury of the third and fourth sacral nerves, the pelvic floor muscles are paralyzed, causing a bulging of the perineum in the male and a prolapse of the uterus in the female.

That cystocele is the most common form of prolapse to occur alone, is probably due to the fact that the utero-pubic fascial plane is thin and poorly developed; in addition it is unduly exposed to pressure during parturition because of its position and firm attachment to the pubis. Moreover the base of the bladder lies close to and directly above the enlarged vaginal aperture and, therefore, sustains unaided the intra-abdominal pressure, often being deprived of the deflecting influence of the antiverted uterus.

Often the stronger lateral and posterior ligaments may resist the downward descent of the uterus, in which case the cystocele, dragging on the cervix below its fixed point, may cause elongation of the cervix.

It is sometimes difficult to determine where the junction of the body and the cervix is, unless we remember that Tandler has called our attention to the fact that the uterine artery marks the separation of the cervix from the uterus. When there is a long cervix it must be amputated or it will worm its way through the smallest vaginal canal, acting as a leader for the uterus and bladder.

A uterus will not descend simply because the vagina is straight and has a wide outlet. It is not uncommon to see cases of badly torn perineum in hard working women with chronic coughs, abdominal tumors and high intra-abdominal pressure without a trace of prolapse. Women who have been torn right through into the rectum often do not have prolapse; they do not strain at stool and further they are possessed of tissues which tend to tear and not stretch.

The vast amount of discussion accorded uterovaginal prolapse during the last few years is convincing proof that there is as yet no general agreement as to the best method of operating; all are agreed however, that whatever method is chosen, thorough vaginal plastic work must be an essential accompaniment in order to insure permanent success.

The only operation which will close the hernial opening consists of approximating the borders of the levator ani muscle between the rectum and vagina. In order to get good results, it is essential that the levator ani muscle should be in a good healthy condition, as a weak atrophied muscle or connective tissue will stretch and give way. If the levator is deficient or atrophied, a piece of gluteus maximus about two inches wide may be detached at its anterior end, and attached to the periosteum of the

pubic arch, also attaching it to the sides of the rectum and vagina. The muscle fibers must not be loosened from their attachment to the coccyx and the sacrum, or their nerve supply will be interferred with.

No operation for the cure of cystocele or prolapse should be undertaken until all of the pros and cons have been thoroughly considered in order that the best type of operation may be selected for each individual case. In the cure of cystocele and prolapse we should not adapt patients to operations, but operations to patients.

There are a multitude of operations recommended for the cure of prolapse and cystocele.

In prolapse, the cervix, if long, should be amputated, after which the stretched lateral pedicles of musculo-fibrous tissue in the base of the broad ligaments should, when sufficiently elongated, be brought in front of the cervix and securely sutured with chrome catgut. The utero-pubic fascia and vaginal mucous membrane are then sutured in the median line. In order to secure good exposure and approximation the dissection must extend well into the lateral fornices, exposing the lower portion of the broad ligaments, and up on the uterus thereby thoroughly freeing the bladder.

Guided by the finger the sutures are passed into the lower portion of the broad ligaments below the blood vessels. With a little care the ureters will not be injured as they were pushed out of the way with the bladder when it was separated from the cervix and broad ligaments. The procedure will lift the cervix well up and push it back into the hollow of the sacrum, forming a long vagina and correcting any retroversion, after which the intra-abdominal pressure will keep the uterus in anteversion. In order to get better approximation and the greatest possible amount of shortening of the broad ligaments the cervix should be pushed up into the vagina before the sutures are tied. All sutures should be interrupted and those nearest the cervix should be tied first. As the lower pelvic diaphragm is a most important supporting foundation to the upper layer of supporting ligaments, it is most essential that the levator ani be securely sutured between the rectum and vagina. A Gilliam or Alexander operation with or without shortening of the utero-sacral ligaments could be added to the above but is unnecessary if the levator ani and the tissue in the perimetrium are in a healthy condition and have a good nerve supply. This is a very satisfactory operation, leaving all of the organs in their normal relations, and does not interfere with child bearing. One should try to do the vaginal work so well that an abdominal operation will not be required. With increasing experience and a more thorough suturing of the perimetrium in front of the cervix, we have gradually extended this operation to more severe degrees of prolapse.

In complete prolapse occurring in a woman during the child bearing period, we do the same vaginal plastic work just described, in addition to which we open the abdomen and shorten the utero-sacral ligaments and do a Gilliam suspension.

In complete prolapse after the menopause, in prolapse with menorrhagia or metrorrhagia near the menopause, or in prolapse with disease of the uterus, the operation of choice should be a vaginal hysterectomy with suture of the broad ligaments; subsequent to this the bladder, utero-pubic fascia and vagina must be sutured to the broad ligaments, care being taken to approximate the lateral portions of the utero-pubic fascia before it is sutured to the broad ligaments. If the attachment is not made sufficiently close to the external urethral orifice, the bladder will not be reduced and the cystocele will persist after the uterus has been removed.

In cystocele without prolapse the operation of choice should consist of a thorough mobilization and elevation of the bladder with suture of the utero-pubic fascia or a dissection of the vaginal mucous membrane from the utero-pubic fascia and overlapping of the fascia as advocated by Rawls. In some patients the dissection of the mucous membrane from the utero-pubic fascia will be most difficult or the fascia will be greatly stretched or attenuated so as to be of little supporting value after dissection, in which case the undissected mucous membrane and utero-pubic fascia should be sutured in the median line after resecting the excess of tissue.

In the past we have performed many interposition operations with excellent results except in one case of procidentia in which the uterus prolapsed, fundus first, through the vaginal orifice with the bladder securely attached to its posterior surface regardless of the fact that the perineum had been carefully repaired. The patient was reoperated and the uterus securely fastened to the abdominal wall after having been bisected and each half sutured to the fascia of the rectus muscle according to the method of Dr. Murphy. This case caused us to discontinue using the interposition operation in complete prolapse especially when the uterus is small and atrophic and to adopt the operation of vaginal hysterectomy with low implantation of the united broad ligaments in the vagina under the bladder as the operation of choice in this type of case in women past the menopause. The only advantage which we can see that interposition has over vaginal hysterectomy is that the uterus, at this age a functionless organ, is left in the pelvis.

In our opinion the interposition operation gives the best results in cases of cystocele when the uterus is of approximately normal size and has been maintained at approximately its normal level in the pelvis of a woman past the menopause or who should for some good reason be sterilized.

Ventro-fixation should be used only as a measure of last resort because it is unanatomical and the uterus occasionally elongates and a cystocele may develop after the parts have been drawn up and the fundus is still securely fastened to the abdominal wall. Ventro-fixation is indicated when the condition of the tissues will not permit of the building up of a good firm perineum.

In conclusion wish to say:

1. The uterus is maintained at its normal level in the pelvis by its ligaments; because of the elasticity of these ligaments it has a considerable range of motion.

2. The pelvic diaphragm when in normal condition prevents the intra-abdominal pressure from stretching the supporting ligaments of the uterus.

3. That any operative procedure for the cure of prolapse or cystocele should aim to restore to as nearly a normal condition as possible the normal supports of the uterus and bladder.

4. That the alteration of the normal relationship of the pelvic organs or their fixation to the abdominal wall should be measures of last resort.

DISCUSSION

DR. ARCHIBALD MACLAREN, St. Paul: I have never heard a paper that all the way through is so surgically sound as this one just presented by Dr. Earl. There is nothing to criticise, but I would like to reiterate some of the points made. In procidentia there are three mechanical problems which always arise, when we come to operate for this curious type of hernia. There is, first, the partial hernia of the child-bearing period, the most important because it is the first step in complete procidentia; this is corrected by perineorrhaphy. The old fashioned widely done operation, will cure all of these cases if taken early before the tissues have become relaxed and over stretched. When you come to the time of the menopause, you have a different, more difficult problem to deal with. You have the perineorrhaphy and other plastic operations on the vagina and the intra-abdominal and interposition operations, none of which would seem to be entirely satisfactory. We have tried them all; for a time all goes well, then we have a relapse, and the next time we try some other kind. Then there is the third type found among the aged women who have gotten through the normal use of the vagina,—the complete procidentia, with the small atropic uterus. In cases of this type the operation as described to me by Dr. Wheeler of St. Paul, is one that should prove very satisfactory. With local anesthesia you infiltrate a small area in the fourchette and then open through under the mucous membrane, and with an old- fashioned Peasley needle you go clear around the vulvar opening following the hymenial line bringing the needle out just underneath the urethra through the mucous membrane. Then putting a silver or bronze wire in through the eye of the needle and pulling it back out at the fourchette; reversing the process you go around the other side in here (indicating) and get the other end and bring it down and twist the wire down on the finger until it will just meet your finger; then cut it off and bury the ends. You can let the patient get up next day. This will hold the hernia just as a truss does, only in a more satisfactory way.

This seems to me to be an operation worth while, in these aged women and especially in women where other operations have been done. If the uterus has been removed and later the prolapse comes back, you have the most difficult problem that comes in this class of work. The uterus removed and the hernia returned. I have had to meet this problem more than once.

DR. WILLIAM A. COVENTRY, Duluth: Dr. Mac-

Laren's remarks about this being the best paper he has heard on prolapse of the uterus reminds me that about three years ago when I read a paper at the St. Paul or Minneapolis meeting he made the same remarks when he got up to discuss my paper. (Laughter.)

I have had one case in which the uterus had been removed, and the patient had a prolapse under the vault of the vagina that remained. I have not seen her since I operated on her a second time. She must be better or she would have returned.

The Murphy type of operation of splitting the uterus and bringing it up between the walls of the recti muscles I think is one of the poorest operations Murphy ever devised. Some of the results I have seen afterward in which part of the mucous membrane remained, and every month the patient has gone through a period of torture trying to take care of the swollen bisected uterus under the abdominal wall.

The point the doctor brings out with reference to stitching the parametrium in front of the cervix to elevate the cervix as high as possible in the vault of the vagina is the big trick of the operation of interposition. Whether you interpose the uterus or do a vaginal hysterectomy or interpose the layers of the broad ligament between the anterior vaginal wall and the bladder, I have found that if I passed these sutures and did not tie them, that is, use interrupted sutures and start to tie them after I fasten them, I can manage the thing much better. If you pass the first stitch through the parametrium and bring it out of the vaginal wall and parametrium and back again and tie it, the vault of the vagina is pulled up so (illustrating). If you pass the sutures first and tie them afterward, in my experience it works better.

I do not believe any intraabdominal operation for prolapse is worth much. The operation as done in my hands is one entirely vaginal, and I think it can be handled entirely through the vaginal route. The cure of cystocele without prolapse, especially after the menopause, I am quite sure is better done by the Watkins interposition operation. The operation to be performed for cystocele before the menopause or during the childbearing period is to go in and find the layers of the fascia to support the bladder. If you cannot find these, the chances are very much against you and you will have a recurrence.

DR. W. H. MAGIE, Duluth: I want to say a word in favor of the Murphy operation for suspending the uterus in a certain class of cases. I think there is a class of cases in which this is absolutely the best operation. This class of cases are those where the uterus is completely prolapsed and are usually in old women, who have passed the menopause. I witnessed Dr. Murphy make his second operation of this kind. Soon after, I had occasion to do the operation myself and the end results were very satisfactory. I have operated six cases by this method and all have been satisfactory. If the operation is properly done and uterus fixed it cannot get away. The case that Dr. Coventry speaks of evidently was not a real Murphy operation. In the first place, Murphy did not advise the operation in women who have not yet passed the menopause; then Murphy recommended complete evisceration of the uterus. This was not done, evidently, in the case Dr. Coventry speaks of.

DR. A. E. BENJAMIN, Minneapolis: There is one sentence in Dr. Earl's paper which I think is the gist of the whole matter, and that is, selecting the operation to fit the case. There are many operations done for the relief of this trouble, and those who are somewhat inexperienced may select the wrong operation and get bad results, and if they do we must not attribute the results to the type of operation or add them to the statistics of the results for that type of operation.

It has been my practice to size up the lack of support in the individual case and to supply these supports in as natural a way as possible. I agree with Dr. Earl that we should correct the trouble before the menopause, if possible, but would say that, instead of doing technically a Gilliam operation, I would do a modified Gilliam, and bring the round ligaments out near the normal exit, over the fascia. Muscle does not support the ligaments very well unless you have some harder, firmer support to put stitches into, such as fascia.

With reference to the other operation for cystocele and rectocele near the menopause, I would agree with the essayist except to say that I have modified the Murphy operation according to a method which I have determined as being satisfactory both to the patient and to the surgeon.

Let me illustrate. (Illustrating on blackboard). This roughly represents the uterus. Very often we have a diseased cervix which may be in the precancerous stage; therefore, we must get rid of the cervix. We will roughly draw the tubes here (indicating). It has been my habit to correct all of the defect below, the torn perineum and amputate the cervix by doing the ordinary Schroder operation; and then go ahead from above and do a laparotomy and completely remove the mucosa and all the body of the uterus excepting the outside and the tubes. We leave healthy ovaries in every instance. We turn the flaps over the fascia of the recti and there fasten them. This also pulls the bladder up. We must be sure, at first, in examining the case, that we can bring the uterus clear up to the abdominal wall. If we try to do the operation when we are not able to get the uterus up so as to touch the abdominal wall, a failure results. When the mucosa is completely removed and the flaps well secured the results are perfect. I have had some women complain of an oozing for a time from the abdominal wound. There is some discharge. We leave a little drain at this point (indicating) extending down to the remaining

portion of the uterus. Sometimes I have made the incision in the uterus transversely, taking the tubes out, and turning one flap forward over the fascia and the other flap upward. That method gives good results as well.

DR. ARTHUR T. MANN, Minneapolis: It seems to me, the foundation of this whole thing is a little better anatomical knowledge, and in my experience the men who have improved their results are those who have gradually acquired a knowledge of the tissues which support the uterus.

This question has been discussed for years; a good deal depends upon just what tissues support the uterus and what to do with those tissues. I think our troubles come before these bad grades of prolapse, however, and in my earlier surgical experience the point that interested me was that the pelvic floor was giving away; that is, the pelvic fascia and the fascia below the levator ani muscle, as well as that above, was giving away. We can prevent these mild grades of prolapse by studying to see whether the pelvic floor is giving away as well as the supports to the uterus above the pelvic floor. One can tell that by pulling the cervix down or bringing it forward and down by the finger. If the ordinary operation is to be done for a retroversion of the uterus, and most of these cases have a retroversion, with or without prolapse, the prolapse must be very distinctly looked for and determined before the operation is decided upon. If there is prolapse, it means stretching of the pelvic floor and stretching of the utero-sacral ligaments. These latter ligaments are difficult to find unless you know how to proceed to find them. When the abdomen is opened, if you put the finger behind the internal os, the utero-sacral ligaments will come out like two bands. I have seen them as strong as a good round ligament. If there is slight prolapse these should be shortened, and where you can get some of the fascia of the pelvic floor, it should be shortened with it. That holds it back.

A straight Gilliam operation which suspends the uterus by these little ligaments is not a good operation, in my opinion. If you take a swing and put the swing board under you and sit on it you will have tension on the ropes; they will have to carry your whole weight. On the other hand, if you put the board a little backward so that the swing board rests between the shoulders, it takes but a little tip to tip the body forward. This principle can be taken advantage of in work on the uterus. The weight should not be brought directly on the round ligaments. The round ligaments can be shortened in any way, but they should be shortened with this understanding, namely, if you can put them as you would a swing board between your shoulders, a little below your shoulders, you can swing yourself forward with almost no tension on the ropes. After you have done that you must utilize the broad ligaments, and in a great many cases the broad ligaments should be brought to the uterus, shortened, and fastened to the uterus.

DR. WILLIAM F. BRAASCH, Rochester: I am not in a position to discuss the surgical procedures advocated by Dr. Earl in his excellent paper. I would like to speak of one feature of the surgical treatment for cystocele and prolapse and pelvic conditions in their relation to the bladder. I have observed young women, as well as older women, who have had previous operations for prolapse and for cystocele, even hysterectomy or panhysterectomy, because of bladder irritability. On cystoscopic examination of many of these patients we found definite cystitis, ulcers, infections of the kidney, tuberculosis, etc., to account for the vesical symptoms and which had been overlooked. The surgeon had evidently inferred that the bladder irritability was caused by the prolapse or by the cystocele without giving the urinary tract a thorough examination. It should be emphasized that these pelvic conditions rarely cause bladder irritability. In fact it is only in the exceptional case that the bladder is affected by any pelvic condition short of a malignant growth or pelvic infection which directly involves the walls of the bladder. I recall one or two cases in which there was residual urine in the bladder because of an extensive or extreme prolapse, but even with that condition other measures occasionally can be used rather than operation to remove the difficulty.

DR. ROBERT EARL, St. Paul, (closing): I wish to thank the members of the Association for their very generous discussion. In reply to Dr. Coventry's criticism of having difficulties with the menstrual fluid flowing into the subcutaneous tissue in cases in which the Murphy suspension operation had been performed, wish to say that this will not happen providing the Murphy technique is closely followed in which case the mucous membrane is entirely removed after the uterus has been bisected, or by using the technique suggested by Dr. Benjamin in which a V-shaped portion of the fundus and the mucous membrane are removed.

In my paper I called attention to the fact that in some women there is a great tendency to stretching of the tissues and in others there is a tendency to tearing. In the patients in whom there is a tendency to stretch, we can only secure good results by building up a good strong perineum. If the levator ani is in such condition that a good strong perineum cannot be obtained, then some type of suspension operation should be added. Of the various suspension operations I know of none which gives as good firm support as the so-called Murphy operation.

SUBMUCOUS ULCER OF THE BLADDER AND ITS SURGICAL TREATMENT*

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Most types of ulcers of the bladder until recently have been treated by means other than surgical. The advent of cystoscopy has placed many of these lesions on a definite etiologic basis, and has shown that most of them are infectious in origin, usually secondary to infection elsewhere is the urinary tract. Ulceration of the bladder of renal origin may vary from the slightest inflammatory change in the mucosa of the bladder to an ulcerative cystitis of the entire bladder. The common ulcerative cystitis is usually easily recognized and ordinarily can be placed on a definite etiologic basis.

The so-called "irritable bladder," that in the past has appeared to be negative on examination of the genito-urinary tract, has baffled urologists, and not until Hunner's first report (1914) of eight cases of "A rare type of bladder ulcer" was a definite pathologic basis presented to account for the symptoms in some cases. In subsequent papers Hunner has reported a total of twenty-five such cases. Since Hunner's first report approximately sixty-two similar cases have been reported in the literature; Hunner, twenty-five; Reed, five; Keene, ten (one of these cases was included in Hunner's series); Fowler, three; Kretschmer, five, and Bumpus, fifteen. The diagnosis was corroborated by operation in fifty-three cases.

Various terms have been used to designate the lesion; on the basis of its pathology we have chosen to call it submucous ulcer. It probably occurs more often than the number of reported cases would indicate.

Thirty-seven cases fulfilling all the requirements for the diagnosis of submucous ulcer of the bladder have been observed in the Mayo Clinic. In twenty cases operation was performed, and the diagnosis was corroborated. Bumpus reported fifteen of these. This report is also confined to the cases in which operation was performed.

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ETIOLOGY

The etiology of the lesion has been obscure since its first recognition. Many possible causes have been suggested, but until recently none has been supported by evidence of proof. The low incidence in the male suggests some cause peculiar to the female. Most observers agree, however, that pregnancy, pelvic infections, pelvic operations, and so forth are not etiologic factors. Apparently they were not in our cases. Of the eighteen women in our series thirteen had had one or more pregnancies; four had never been pregnant. Two had had symptoms immediately following confinement, and one during pregnancy. Three of the women were single and presented no evidence of genito-urinary or pelvic infection. Frequency and bladder irritability at times follow pelvic operations, but while many of our patients had been operated on previously, only one patient dated the symptoms from a pelvic operation, suspension of the uterus. Because of the location of the lesion in the dome or lateral walls of the bladder and the absence of infection in the urinary tract most observers agree that it is not a urine-borne infection. Hunner has suggested the teeth, tonsils, and sinuses as possible foci of infection; others have also suggested remote foci, and the accumulating evidence supports the theory of a blood borne infection, placing the lesion on an etiologic basis with duodenal and gastric ulcers.

Rosenow's work on the selective affinity of organisms obtained from foci of infection suggested to Bumpus and Meisser a series of experiments which tend to show the selective affinity of certain strains of streptococci for the urinary bladder. Since in simple ulcers of the bladder and cystitis of unknown cause the urine contains the colon bacillus, this organism generally has been considered responsible. Bumpus and Meisser have shown, however, that pyelonephritis is often due to foci of infection harboring streptococci which have selective affinity for the urinary tract, and that the colon bacillus is of secondary importance. They report the results of the injections of thirty-three animals with cultures obtained from six pa-

tients with submucous ulcer of the bladder. Sixteen of nineteen animals injected intravenously with primary cultures from the teeth or tonsils had lesions of the urinary tract; thirteen of these were in the urinary bladder. On second animal passage, injection of streptococci obtained from the lesions in the kidney and the urine of rabbits injected with the primary culture, produced lesions in the kidney in four of the five animals. In nine animals injected with cultures from the urine of the patients, lesions of the urinary tract occurred in six of seven in which the culture contained streptococci, and in neither of the two in which the culture contained only the colon bacillus. Bumpus and Meisser furthermore demonstrated diplococci within the submucous ulcer excised in two patients. The results of their investigation, it seems, justify their conclusion that submucous ulcer and other infections of the urinary bladder may be due to focal infections harboring streptococci which have a selective affinity for the urinary tract.

Since the teeth, tonsils, and sinuses are foci of infection common to the male and female, it seems that some additional etiologic factor other than focal infection must explain the frequency of the lesion in the female and its rarity in the male.

PATHOLOGY

The detailed pathology of submucous ulcer has been described by Hunner, Kretschmer, and others, and their agreement in the essentials of its pathology is assurance that the lesions in the cases reported are all of the type first described by Hunner. Suffice it to repeat that the ulcer develops as the result of chronic inflammation involving all coats of the bladder; it usually is surrounded by a variable amount of edema which may involve the major portion of the bladder dome and at times extend into the paravesical tissues. This, as the results of surgical treatment show, is of great importance in the surgical treatment of the lesion.

The ulcer is usually single, but may be multiple. It was single in most of the reported cases, and in only one of our surgical cases were there two ulcers. The lesion is found in the free portion of the bladder. In our series it occurred in the dome in thirteen cases, in the posterior wall in three, in the left wall in two, and in the right wall in two. The ulcer itself is usually small. In our series it varied in diameter from 3 mm. to 2.5 cm.; in fourteen cases it was 1 cm. or more in diameter. While the true ulceration is small the edema and inflammatory reaction about the ulcer may be very extensive.

SYMPTOMS

The symptoms have been described by the various observers; those in the reported cases and in our cases are quite uniform: pain, frequency, and bladder irritability are present in all. The pain is not always confined to the bladder, but at times is referred to the perineum and rectum and often to the inguinal region on the same side as the ulcer. The irritability necessitates voiding every few minutes and is little alleviated by change in the reaction of the urine or by lavage of the bladder.

The lesion occurs most frequently in the middle decade of life. Our youngest patient, at the time of admission to the Clinic, was twenty-eight years of age, and the oldest fifty-six, an average of forty and seven-tenths years. The average duration of symptoms before admission to the Clinic was eight and seven-tenths years. The youngest age at the time of onset was nineteen years, the oldest forty-nine; the average was thirty-two. This average is somewhat higher than that in Hunner's series of twenty-five cases, in which it was twenty-five years. However, the average duration in his cases was thirteen years and the average age of the patients at the time of consultation thirty-eight years. The slight variations in these ages is of little consequence; the figures are important, however, since they show that the symptoms of this particular lesion are persistent for years, and that the lesion has been particularly resistant to all forms of treatment to which it has been subjected.

DIAGNOSIS

The diagnosis of submucous ulcer of the bladder is based on the history, urinalysis, and cystoscopic findings. Hunner states: "Given a patient who has had years of bladder misery in spite of many courses of treatment, who has clear urine macroscopically, free from infec-

tion, but containing blood cells and leukocytes, and cystoscopic examination reveals one or more ulcers, one is justified in making a diagnosis of this type of ulcer."

In our cases pain and frequency were the predominating symptoms, and they were present in all cases; tenesmus was associated in nine cases. Fourteen of the patients gave a history of hematuria, while examination of centrifuged urine showed no red blood cells in eleven cases, but in small numbers in nine. The examination of centrifuged urine in seven cases was entirely negative for microscopic elements. Pus cells were found in thirteen cases, but in none of these were they present in more than small numbers. Cystoscopic examination disclosed no evidence of cystitis or infection of the urinary tract, except the localized area of edema or inflammatory reaction about the ulcer.

TREATMENT

Patients with submucous ulcer of the bladder have been subjected, by virtue of the long duration of symptoms, to all types of treatment, including lavage of the bladder with various solutions, suprapubic drainage of the bladder, and fulguration of the lesion. Little more than slight or temporary amelioration has been accomplished in most instances. Previous to the recognition of the true cause of symptoms many patients were subjected to pelvic and abdominal operations without success. The cause of "irritable bladder" was not attacked directly by surgical methods until its recognition by Hunner. On the pathologic basis of this type of ulcer, that is, a chronic inflammatory process involving all coats of the bladder and usually surrounded by a variable area of edema, Hunner advocates wide excision of the ulcer and the edematous bladder wall. He attributes recurrence after resection to incomplete removal of the edematous bladder wall.

RESULTS OF SURGICAL TREATMENT

In view of the suggested etiology of submucous ulcer of the bladder and a review of our cases in an effort to ascertain the results of surgical excision of the ulcer, it seems that surgical treatment of the lesion is often insufficient for the complete eradication of the ulcer and the elimination of the possibility of recurrence.

The immediate results following wide excision of the entire thickness of the bladder wall and the surrounding inflammatory tissue were excellent in our series; practically all the patients were free of their symptoms or were markedly improved on leaving the hospital and on dismissal from the Clinic. The ultimate results, however, have not been so good. Seventeen of the twenty patients operated on have reported to us. Five are well and entirely free from bladder symptoms, two after three years since operation, one patient after two and one-half years, one after two years, and one after one year. Five patients report improvement since operation, one patient after three years, one after two years, one after nine months, and two patients after four months. Three patients report no improvement following operation; two after three years, and one patient after six months. Four patients experienced temporary complete relief, with subsequent recurrence of all symptoms, one patient after two years, two patients after one year, and one patient after six months. Cystoscopic examination of one of these patients after one year of relief disclosed a recurrence of the ulcer.

In all of the cases, except those of Keene, reported in the literature, that have been treated by surgical means, the immediate and not the late results have been stated. Five of the eight cases which Hunner first reported were treated by surgical excision of the ulcer. Not more than eight months had elapsed since operation in any case except that of his first patient, who had remained well for six years. The results in his Case 3 were good after two months, in Case 4 after six months, and in Case 8 after eight months. A recurrence of the symptoms took place in Case 5 two months after operation, which the author attributes to incomplete removal of all the edematous tissue about the ulcer. In a subsequent paper Hunner reports a recurrence of symptoms in Case 3 one and one-half years after operation, and evidence of recurrence of the ulcer on cystoscopic examination, recurrence of symptoms in Case 9 one year after operation, and in Case 12 one and one-half years after operation.

The time elapsing since operation in Keene's cases ranges from two months to two and one-

half years, with recurrence in Case 2 after seven months. The period since operation was two and one-half years in Case 1, two years in Case 2, twenty-three months in Case 3, twenty-one months in Case 4, sixteen months in Case 5, nine months in Case 6, three months in Case 7, and two months in Case 8.

Kretschmer's cases were all reported within six months of the operation, too short a time to ascertain the ultimate results. The same is true of Reed's three surgical cases.

It is obvious from the review of this series that the ultimate results of the surgical treatment of submucuous ulcer cannot be accurately stated immediately after operation, for, while most recurrences result within a year, it seems that the possibility of recurrence cannot be eliminated within two years after operation. Even though permanent good results by surgical methods cannot be assured in all cases of submucous ulcer, the large number of cases in which complete relief, and those in which temporary relief or benefit is obtained from operation, make the surgical incision of this type of ulcer warranted in all cases. Hunner states, "No type of treatment suffices except wide excision of the inflammatory area." To this demand, in the light of the advances which have recently been made in establishing the cause of the lesion, should be added the elimination of removal of all foci of infection, particularly in the teeth, tonsils, and sinuses. The removal of such foci in conjunction with wide surgical removal of the ulcer should increase the percentage of permanent relief and decrease the number of recurrences.

BIBLIOGRAPHY

1. Bumpus, H. C., Jr.: Submucous ulcer of the bladder in the male. Jour. Urol., 1921, v, 249-253.
2. Bumpus, H. C., Jr. and Meisser, J. G.: Focal infection and selective localization of streptococci in pyelonephritis. Study I. Arch. Int. Med., 1921, xxvii, 326-337.
3. Fowler, H. A.: Ulcer of the bladder (Hunner type). Jour. Am. Med. Assn., 1920, lxxv, 1480-1483.
4. Hunner, G. L.: A rare type of bladder ulcer in women. Report of cases. Tr. South. Surg. and Gynec. Assn., 1914, xxvii, 247-292.
5. Hunner, G. L.: A rare type of bladder ulcer. Jour. Am. Med. Assn., 1918, lxx, 201-212.
6. Hunner, G. L.: Elusive ulcer of the bladder; further notes on a rare type of bladder ulcer with a report of twenty-five cases. Am. Jour. Obst., 1918, lxxviii, 347-395.
7. Keene, F. E.: Circumscribed pan-mural ulcerative cystitis. Ann. Surg., 1920, lxxi, 479-485.
8. Kretschmer, H. L.: The surgical treatment of so-called elusive ulcer of the bladder. Jour. Am. Med. Assn., 1921, lxxvi, 990-995.
9. Reed, C. A. L.: Irritable bladder in women. Jour. Am. Med. Assn., 1919, lxxij, 332-335.
10. Rosenow, E. C.: Studies on elective localization. Focal infection with special reference to oral sepsis. Jour. Dent. Res., 1919, i, 205-268.

DISCUSSION

DR. GILBERT J. THOMAS, Minneapolis: I think any one of us who have had to treat cystitis which did not respond to treatment will appreciate the importance of this paper.

In 1915 I reviewed 250 cases of infection of the urinary tract in a paper presented before the Chicago meeting of the American Urological Society. I was able to find definite foci of infection at the time of examination in between 75 and 80 per cent of the patients studied. In the remaining 25 per cent the history indicated that infection had been present some place in the body with secondary invasion of the urinary tract.

Bacteriologic study revealed 60 per cent of the urines contained colon bacilli. We were impressed with the fact that the infection was the result of a more virulent organism than the colon group, probably some of the streptococcic group. We did not prove this bacteriologically at this time. Rosenow was just beginning his work on the selective affinity of organisms for certain tissues so that clinically we were of the opinion that the streptococcus, which is usually found in carious teeth, tonsils, and so on, was the offending organism in our urinary infections, and that it had some selective affinity for the urinary tract, but was not usually found when we cultured the urine. In addition to the teeth and tonsils, occasionally we found the gall-bladder and the appendix to be foci of infection, and in one case a chronic infection of the ear was the source of urinary involvement.

In my experience most cases of "Hunner" or "submucous ulcers of the bladder" are associated with pyelitis or pyelonephritis and are secondary to foci elsewhere in the body. Frequently, catheterized urine from the bladder or kidney will contain only an occasional pus cell, and probably none at all, but cultures will most often grow an abundance of colon bacilli and sometimes staphylococci. We have examined patients presenting a typical history and symptoms of submucous ulcer of the bladder, whose bladders have not shown the typical areola and ulcer. In these individuals we have been able to find pyelitis or pyelonephritis. Bimanually a definite pain area on palpation was found over the bladder.

In other words, it is my opinion that we do

have a sort of pre-ulcer stage in which localization of the infection has taken place in the bladder, but in which the typical picture, as seen with the cystoscope, is not prominent enough to enable us to make a diagnosis.

In addition to surgical removal, as Dr. Hunt has pointed out, we should be careful to remove all foci of infection. That means, of course, a complete and thorough examination not only of the head but of all other organs to be sure we are not overlooking some chronic focus.

Vaccines may be of some value in the pre-ulcer stage to prevent the formation of ulcer, and also in the treatment of those cases that have been operated upon. As Dr. Hunt has described, when the ulcer is present the only treatment then is surgical removal, but in order to prevent recurrences it is very essential first to remove all foci of infection. In addition it is possible we may be able to do something with a vaccine made from the offending streptococcus to prevent recurrences and to clear up any edematous areas which may have been left after the patient has been operated upon.

This subject is a new one and is very important. Up to the present time we have not fully appreciated the importance of this type of ulcer of the bladder. The first report which Hunner made called our attention to the cause in many cases of incurable cystitis in which up to this time no etiology could be found. Dr. Hunt's statistics of cures are not as brilliant as some that have been reported but his cases have been thoroughly worked out, and I think his opinion and statistics are of great value to the members of this Association. I wish to thank Dr. Hunt for the honor of discussing his paper.

DR. A. H. SCHWARTZ, Duluth: I would like to bring out one point in reference to these ulcers of the bladder, and that is the decision as to the time of operation. It has been my practice to wait some little period of time after the removal of the foci of infection, whether the foci of infection be the teeth, the sinuses or the tonsils.

I believe the reason that many of these ulcers of the bladder have not been benefited by operation, is that the protective wall which the infection has thrown around itself has been too quickly removed.

Possibly if we wait a longer time in these cases, they would get well without any operative procedure.

DR. WILLIAM F. BRAASCH, Rochester: I would like to make a few remarks endorsing what has been said by those who have taken part in the discussion. Ulcer of the bladder is frequently observed together with infections of the kidney, and as long as the renal infection is present it is futile to operate with a view to removing the ulcer. The high percentage of Dr. Hunner's success is due to the fact that in the patients whom he operated upon the infection of the bladder wall was localized. Doubtless a pyelonephritis previously existed and was the original cause of vesical infection. The renal infection was the first to disappear and later the bladder infection cleared up with the exception of a localized area of infection which persisted in spite of bladder lavage. I believe if the surgeon waits until he has such a condition to deal with, his percentage of success will be greater. It is necessary, however, that the condition be localized to one area for if there are several areas in different parts of the bladder surgical treatment will not be so successful.

It should be emphasized that the removal of all foci of infection is essential to complete recovery. Patients with ulcers of the bladder are often observed to suffer with chills and fever and marked exacerbation of vesical irritation for a day or so following removal of infected teeth. With extraction of the teeth there is evidently a sudden influx of the infecting organisms into the system which lights up the old infection causing the exacerbation of symptoms These patients should be conservatively treated at first with bladder lavage, topical applications, and removal of foci infection. Fulguration should also be tried since in some cases it has been beneficial. If none of these measures afford the necessary relief then surgical procedures should be instituted, but only when the process is localized.

DR. VERNE C. HUNT, Rochester (closing): We are all pretty much in agreement on the results of the experimental work performed in establishing, on a bacteriologic basis, the etiology of this type of lesion of the bladder. We may say that it is the first piece of work which places this lesion on a definite etiologic basis. This ulcer was not recognized for a long time. It produced a type of cystitis which in the past has been subjected to various kinds of treatment. I believe with Dr. Braasch that the employment of various types of treatment, such as bladder lavage, topical applications of silver nitrate, fulguration, and so forth, has accomplished much for these cases and will do more in the future if used in conjunction with the removal of foci of infection. As Dr. Braasch says, our patients should have the advantage of various types of treatment other than surgical in the light of results that have been obtained, and when these fail surgery should be resorted to.

Another thing I wish to mention is the determination of the results of surgical treatment or any form of treatment of this type of ulcer. The earlier reports lead us to believe that the ultimate results of surgical treatment of this type of lesion are excellent. But in a few months or a year or two recurrences are apt to occur. Patients should not be regarded free from symptoms for at least two years. . In most as cured unless they remain so and are absolutely cases reported in the literature we cannot judge whether patients have been completely cured or relieved by operation.

DUODENAL ULCER*

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Duodenal ulcer is one of our commonest causes of indigestion. This paper, like most dealing with this subject, will contain considerable contrasting reference to ulceration above the usual limits ascribed to the duodenum. A rather complete study has been given to the literature, which when summarized furnishes data showing:

(1) The very definite value of surgery in the treatment of duodenal ulcer.

(2) The recognized failure of surgery to cure from twenty to forty per cent.

(3) The well known tendency to development of gastrojejunal ulcer for reasons not yet well understood.

(4) That most of the statistical data furnished that are reliable, backed up by satisfactory roentgen evidence, are from the surgeon.

(5) That the Anglo-American statistics clearly enough differentiate gastric and duodenal ulcer; give the roentgen evidence assisting in the establishment of diagnoses; and consider chiefly a chronic indurated ulcer as being surgical.

(6) In contrast to this, the continental statistics include considerable reference to postmortem findings, but are not clear on differentiation between definite chronic, indurated ulcer and various erosions that might well be terminal events.

(7) Whether or not the more recent continental evidence accumulated since the routine use of roentgen methods might more nearly conform to the Anglo-American, certain it is that the deflection of the war has undoubtedly been a factor in holding back their present opinions.

It is certain that but few statistics concerning the medical care of duodenal ulcer are at hand. More of these are needed, backed up by the same sort of evidence, particularly roentgenological, upon which the surgeon is now determining in favor of surgery. As far as the medical regime is concerned, there will always be the lack of absolute confirmation which the surgeon has when he palpates the condition present. On the other hand, the properly trained roentgenologist has had his work checked over so freely by the surgeon that it is fair to assume that fully ninety per cent of his diagnoses are correct, taken together with the history of the patient and the other well known corroborative signs. In over two hundred cases of ulcer diagnosed by the roentgen ray, we have found the evidence trustworthy in all those cases which came to operation. Whatever limitations the roentgen ray may have, when it does make a diagnosis it not only gives the location but gives much evidence in regard to the type of ulcer (penetrating or callous), complications or impending complications, and upon these fundaments the type of treatment should depend.

Proper medical statistics are further necessary because, despite the apparent unanimity of the surgeon and internist, often expressed in discussions and symposia before medical meetings and clinics, there is still a wide divergence of opinion, largely because each has seen the failures, but not the successes, of the other, and bias is bound to develop. Much is yet to be learned from unbiased observers. This is admirably illustrated by Eggleston[1] in his study of the records of the cases of gastric and duodenal ulcer at Battle Creek, Michigan. Some of the results of his review were surprising to me, and it is one of the prominent features that stimulated me to review our own records. In reviewing more than sixty articles published since 1912, dealing with ulcer and its treatment, there are only two writers who discuss the medical aspects of the disease, presenting statistical data on the results of treatment, from which the reader could properly draw conclusions in keeping with those presented by the surgeon. In fact, much of our knowledge of ulcer and its incidence can be attributed absolutely to the conviction of the surgeon who demonstrated the "living pathology," and thereby justified his disdain for the abdominal wall.

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SURGICAL STATISTICS AND THEIR MORTALITY

In judging any surgeon's mortality statistics, it would be only fair to know the type of patient being referred to him. This means that in a clinic where most patients are given medical treatment by preference, he will only get the severe cases; his mortality will be correspondingly high. Contrarywise, the clinic in which the weight of opinion is surgical will get patients who are better surgical risks. Surgeons of the very highest repute have commented on this, usually where they have been in association with strong minded internists.

Balfour[2] reviews 2,875 duodenal ulcers, with a mortality of 1.6 per cent.

Coffey[3] operated on 233 ulcers, with a mortality of 4.33 per cent.

Deaver[4], from 1909 to 1915, operated on 179 duodenal ulcers, with a mortality of 3.35 per cent.

Finney and Friedenwald[5] report a group of 100 cases operated on by Finney's pyloroplasty, with a 5 per cent mortality, and 93.6 per cent cured or with satisfactory results.

Hohlbaum[6] gives a mortality rate of 11 per cent on 46 non-perforating ulcers which received surgical treatment, but only 18 patients were finally symptom free.

Lemon[7] states that 81 per cent of the patients operated on at the Mayo Clinic are considered cured, and an additional 10 per cent improved.

Moynihan[8] reports 187 cases of duodenal ulcer, with a mortality of 2.4 per cent, and 79 per cent cured.

Petren[9] gives his results on 283 cases of non-perforating gastric and duodenal ulcers operated on since 1896 at various Swedish hospitals. The mortality rate was 6 per cent in a series operated on from 1904 to 1908. Fifty-two per cent remained cured; 21 per cent were improved; 27 per cent have had serious gastric trouble since the operation.

Troell[10] reports on 234 surgically treated ulcers, with a mortality of 8.5 per cent previous to 1916, and since then a mortality of 6 per cent. The end result after a period of from one to nine years is 70 per cent alive and fully recovered or improved. Twelve per cent had to submit to a subsequent operation, and 3.5 per cent had died of gastric disease.

The foregoing data are considered representative of the surgical talent at home and abroad, and from these data we conclude that the number of patients cured by operative procedure is from 52 to 81 per cent, and the immediate mortality from 2 to 11 per cent. In other words, a patient with a duodenal ulcer, submitting to operation, stands about one chance in twenty-five of dying, and less than three chances out of four of obtaining a cure.

CONSIDERATION OF THE RELATIVE COMPLICATIONS OF GASTRIC AND DUODENAL ULCER

There has been an increasing tendency against recommending medical treatment for ulcers of the stomach except in selected cases. The basis upon which this contention is grounded deserves the most careful consideration:

(1) Ten to twenty per cent of gastric ulcers are penetrating in type. These ulcers are apt to invade vital organs, sometimes doing irreparable damage. It is generally agreed, however, that the decisive roentgen evidence, including a niche, may disappear under a medical regime.

(2) Gastric ulcer tends to produce definite deformities of the stomach, not easily corrected by later surgical procedure, and when so corrected may leave poorly functioning stomachs. Therefore, earlier surgery would have given better results. Perforation and hemorrhage will be considered in contrasting similar complications of duodenal ulcer.

(3) The greatest weight has been given to possible malignant development on an ulcer base. This is neither the time nor place to enter into a full discussion upon the precancerous possibilities of chronic gastric ulcer. Nevertheless, the evidence so far presented to justify the contention that chronic irritation in the stomach, as elsewhere, may lead to malignancy, deserves unusual study. The clinical evidence has long been against the contention that ordinary carcinoma in the stomach arose on ordinary ulcer. There is some clinical evidence to substantiate the pathological contention that gastric ulcers may become malignant. I followed one roentgenologically proved ulcer, which responded therapeutically and favorably for a year, and then developed surgically proved carcinoma at the site of the ulcer. The

location was high up on the lesser curvature—too high for resection as a cancer—but probably operable in its ulcer stage. Observations such as this should be most carefully recorded, because the pathological evidence alone is insufficient, as presently offered, to throw so decisively the indications for the treatment of gastric ulcer to the surgical side.

MacCarty[11], before the annual meeting of the American Roentgen Ray Society in 1920, gave the data upon which he decided that two chronic, indurated ulcers, macroscopically alike, should in the one case be classified malignant and the other not. This is a momentous differentiation, and if correct can manifestly only be made by a pathologist studying the tissues, as MacCarty states, immediately after removal. It concerns such technical features as the study of properly made frozen sections under the oil imersion lens, with attention particularly to the characteristics of the individual cells, the size of its nucleus, the presence or absence of nucleoli, in addition to the usual consideration of penetration of these cells into the fixed tissues. MacCarty states, "These cells themselves are morphologically indistinguishable from cells which are definitely known to be carcinomatous."

In the present stage of our knowledge, are we justified in relying on this evidence alone for the making of this momentous decision? Can the ultimate gross tissue process be judged entirely on the individual character of its cell components? This represents a new pathological conception, and the full, complete answer is not yet forthcoming.

Fortunately, in dealing with duodenal ulcer, there is no such division of opinion on the possibilities of malignant implantation. Here we see more clearly what our attitude might be toward the medical or surgical treatment of ulcer were malignancy not a possibility. Here we see more clearly the need of closely scrutinizing the pathological data and findings in gastric ulcer as above intimated.

FURTHER SPECIAL CONSIDERATIONS OF DUODENAL ULCER

(1) It is rarely of the penetrating type, and less commonly involves the pancreas.

(2) Severe deformity of the cap rarely produces any thing more serious than pyloric obstruction, the surgical treatment of which has produced the most brilliant surgical results. It has been the complication increasing most strikingly surgical cure. Eusterman[12] states that 95 per cent of these cases with advanced pyloric stenosis are permanently cured.

(3) Perforation of a duodenal ulcer is probably more common than perforation of gastric ulcer, but is less serious. Gruber[13] states that perforation occurred in 17 per cent of duodenal ulcers, as against 5.6 per cent of gastric ulcers. Alexander[14], in a study of 157 cases of ulcer treated at the Episcopal Hospital, Philadelphia, found that 22 per cent had acute perforation. Hospital and surgical statistics, of course, do not reveal the true incidence between duodenal ulcer and acute perforation, because all acute abdominal cases are very likely to reach the hospital and come to the attention of the surgeon. Mayo[15] states that acute perforation in ulcer of the stomach is less common than in ulcer of the duodenum, but in the former there is less liklihood of the ulcer being protected by adhesions. The gastric capacity is large, so that considerable contents may escape. Since the contents are relatively much less sterile than in the duodenum, there is a greater chance of perforation producing septic peritonitis. He also adds that ulcer of the stomach is a more serious condition than ulcer of the duodenum, but fortunately less frequent. The mortality rate of acute perforation treated surgically is given by different writers as follows:

Farr[16] reports 24 operations for perforating ulcer, with 3 deaths.

Gaird[17], in a collective review of a series of 200 cases of perforating ulcer treated in Edinburgh between 1896 and 1912 by a number of different Edinburgh surgeons, found that in 145 cases operated on between 1908 and 1912 there were 94 recoveries and 51 deaths, approximately 65 per cent recovering. In 116 cases operated on within the first 12 hours after the onset of symptoms, there were 75 per cent who recovered.

Gibson[18] reports 14 operations for perforating ulcer, with 1 death.

In this clinic we have operated upon 7 perforations in the past four years, with no deaths.

In our own experience only 8 acute perforations have been observed, representing about 2 per cent of all ulcer cases seen. Considering the frequency with which duodenal ulcer is now diagnosed, I feel that our figures are worthy of consideration as representing approximately the incidence of perforation in ulcer cases. If 75 per cent of these can be saved, the fear of acute perforation should not be great.

(4) Hemorrhage occurs with about the same frequency in gastric ulcer as duodenal ulcer.

Balfour[2], in a series of 2875 doudenal ulcers operated on, found that 20 per cent gave a history of hemorrhage, and that 12.7 per cent still had hemorrhages after a gastroenterostomy.

Gruber[13], in a report of 140 cases of ulcer found at autopsy, gives hemorrhage as a cause of death in 4.4 per cent, as against 3.6 per cent in gastric ulcer.

While such figures are, in a measure, discouraging, I am forced to believe from our own experience, together with that of others, particularly Eggleston's[4], that fatal hemorrhage in duodenal ulcer is extremely rare.

(5) Postoperative complications or unsatisfactory physiological perversions after gastroenterostomy, and notably gastrojejunal ulcer, are an unfortunate sequela of fully 20 per cent of duodenal ulcers operated upon. This must stand at the present time as a distinct deterrent to surgical treatment.

If the foregoing comparison of the complications of gastric and duodenal ulcer is correct, duodenal ulcer must be considered a relatively benign disease, and carrying far less danger to its host than gastric ulcer.

DATA ON 104 CASES OF DUODENAL ULCER

This review deals with 104 cases of duodenal ulcer, in which the diagnosis was confirmed by the roentgen ray. In order that at least two years should have elapsed since they were first seen, none was included that occurred after Jan. 1, 1919.

Eleven had had symptoms less than three months, and four less than one month. It shows that a considerable number of duodenal ulcers are being diagnosed at a relatively early age, and often in their first attack. It must be frankly admitted that the decisive evidence upon which this early diagnosis was made came through the routine use of the roentgen ray. In fact, the roentgen evidence is going to change greatly our conception of the age incidence of this disease. Eleven, or 10 per cent, showed some degree of retention by the barium meal, but only three had a marked retention. Five gave a history of hemorrhage. Forty of the 104 cases were operated upon, with an immediate mortality of 6.1 per cent. Sixty per cent reported themselves free from symptoms since the operation, 28 per cent improved, and 12 per cent unimproved.

The remaining 64 patients were treated medically or not at all. Eight cases had hospital treatment, 6 of them remaining well, and 2 having recurrences. There were 46 cases which had what we term "ambulatory" treatment. This consists in the giving of five or six feedings of a diet consisting chiefly of carbohydrates, with alkalies between feedings, and the patient is permitted to continue his usual activities. Thirty of these patients have been heard from. The length of time they staid on the diet varied from 3 weeks to 2 years. Eleven of these 30 patients have reported no return of symptoms for more than 2 years. Seven report remissions, but consider themselves improved. Three are unimproved. It is rather startling that 36 per cent of these patients should have remained well on a treatment so simple. It is further strikingly evident, strongly supported by the recent literature, that the fundamentals involved in the proper medical treatment of duodenal ulcer are relatively simple.

Wright[19], through an intensive study over several years of the dispensary material at the University of Minnesota, came to exactly the same conclusions.

CONCLUSIONS

(1) A little more than one-half of duodenal ulcers in this series treated by gastroenterostomy got complete relief. The relief was absolute; they are free from any digestive disturbance, and usually eat what they please. Twenty-five per cent were benefited, and 12 per cent not improved.

(2) Thirty-five per cent in this series of uncomplicated duodenal ulcers responded to rather simple dietery restrictions and alkalies, at

least insofar as remaining symptom free for a reasonable period of time is concerned.

(3) At the present stage of our knowledge, the fear of possible maligancy arising on gastric ulcer must still be a large determining factor in the choice of surgical treatment; but, the situation deserves the most intensive study.

(4) Considering the fact that duodenal ulcer is exceedingly common and relatively benign, and many people go through life with this ailment without treatment and without much inconvenience, it seems entirely reasonable that all cases not presenting definite and well known surgical complications, should be given the benefit of medical treatment. This must remain true despite the remarkable surgical results of treatment in properly selected cases. The successes enumerated, from 50 per cent to 80 per cent, variously estimated, still leave 20 to 50 per cent whose only remaining hope is further questionable surgery, or medical treatment. Would it not be advisable to try medical treatment first?

BIBLIOGRAPHY

1. Eggleston, Elmer L.: A critical review of five hundred cases of gastric and duodenal ulcer. Journ. A. M. A., Dec. 1920, p. 1542.
2. Balfour, D. C.: Bleeding type of gastric and duodenal ulcer. Journ. A. M. A., 1919, lxxiii, p. 571.
3. Coffey, R. C.: Gastroenterostomy still the treatment for chronic gastric and duodenal ulcer. Ann. Surg., 1920, lxxii, p. 303.
4. Lyon, B. B. V.: The medical treatment of gastric and duodenal ulcers. Internat. Clinic, 1917, Vol. 1. 1.
5. Finney and Friedenwald: Clinical study of 1000 cases of ulcers of the stomach or duodenum. Am. Journ. Med. Soc., 1912, cxliv, p. 157.
6. Hohlbaum, J.: Zur chirurgischen Therapie des cronischen Duodenalgeschwuers. Arch. f. Klin. Chir., 1920, cxiii, p. 499.
7. Lemon, W. S.: Routine management of duodenal ulcer. Northwest Med., 1919, xviii, p. 179.
8. Moynihan, B.: Diagnosis and treatment of chronic duodenal ulcer. Lancet, Lond., 1912, clxxxii, p. 9.
9. Petren: End results of operations for perforated gastro-duodenal ulcer. Surg., Gynec. and Obst., 1912, xiv, p. 544.
10. Troell, A.: Ueber Ulcus chronicum Ventriculi et Duodeni. Deutsche Ztschr. f. Chir., 1919, cxlix, p. 1.
11. MacCarty, W. C.: Chronic gastric ulcer and gastric carcinoma; a study of 507 simple ulcers and 895 carcinomatous ulcers. The Am. Journ. of Roentgenology, Vol. 7, No. 12, Dec., 1920, p. 591-596.
12. Eusterman, G. B.: Journ. Mich. State Med. Soc., Jan. 1921.
13. Gruber: Mitteil a. d. Grenzgeb. d. Med. u. Chir., 1912, xxv, p. 465.
14. Alexander, E. G.: Acute perforations of gastric and duodenal ulcers. Ann. Surg., Phila., 1916, lxvi, p. 72.
15. Mayo, W. J.: Gastric ulcer, Journ. A. M. A., lxv, p. 1265.
16. Farr, C. E.: Perforating gastric and duodenal ulcer. Ann. Surg., Phila., 1920, lxxii, p. 591.
17. Gaird: Perforated duodenal ulcer. Edinburgh Med. Journ., 1913, xi, p. 405.
18. Gibson, C. L.: The end-results of 14 operations for perforated gastric and duodenal ulcers. Surg., Gynec. and Obst., 1916, xxii, p. 388.
19. Wright, C. B.: Duodenal ulcer—medical theatment in ambulant cases. Journal Lancet, July 1921, vol. xli, p. 396.

DISCUSSION

DR. CHARLES B. WRIGHT, Minneapolis: Dr. Martin has asked me to say a few words on our experience at the University in the treatment of a certain type of ulcer cases—the ambulatory type.

First, we must properly classify ulcers. I think it is a great mistake to treat some types medically, and just as great mistakes are made in treating other types surgically. I think we have now reached the place where we can differentiate very well. We have had large experience in treating the simple acute ulcer without definite complication. These cases come complaining of pain, fear of eating and the various things that go with it. In handling these cases we are constantly dealing with patients who refused hospital care, because they had dependents and were not ill enough to go to bed. We thought best to treat them more or less by the ambulatory method rather than not at all, and we were much astonished to find that a large percentage were entirely relieved, and remained well over a period of three or four years on our very simple regulation. So we do not hesitate to treat a case that has no complications. On the other hand, we do not attempt to treat ulcers that show retention or vomiting or any evidence of perforation or hemorrhage.

Smith has laid emphasis on one great essential in treating ulcer, that is, the removal of evident foci of infection. You will not cure by removal of the focus, but you are much more liable to prevent recurrence. I think this is a very important thing.

As to the other phases of the ulcer question, I am sure that I can add nothing to what Dr. Martin has said in his valuable paper.

DR. H. K. SCHAAF, Minneapolis: I enjoyed Dr. Martin's paper immensely because it differed from the average paper on the subject. Usually we hear the enthusiastic report of the internist or the sur-

geon advocating his own methods of treatment and giving no consideration to the other side. I do not know of a medical subject where we have more differences of opinion concerning medical or surgical treatment than in hyperthyroidism and ulcer, and there is no reason for it, because there are definite indications for either method of treatment. The trouble is that we have been misled by statistics. Many of us do not seem to realize that there is a great difference in the material seen by the general practitioner, the internist and the surgeon. We know that there are certain cases of gastric ulcer that do get well, but I believe these are of a superficial type that very often does not recur. They are seen most frequently by the man in general practice, and when we get their statistics, we do not accept their findings, because their material has not been checked up by roentgenological evidence. On the other hand, we know that many of the cases that recur never do get well; they never heal, even following gastroenterostomy. Those are the cases seen by the internist or by the clinics because they have failed to obtain relief elsewhere.

We must try to obtain statistics from different sources and from different types of cases to be able to draw fair conclusions, and that is what Dr. Martin has tried to do. I think I can illustrate this also from our experience.

Dr. Martin reports a fairly high percentage of cures of his cases. Dr. Wright, in the out-patient department of the University of Minnesota, has seen a fairly high percentage of cures in his cases, but they admit they are seen in their first attack in many instances. We have gone over our statistics for five years and I was surprised that only a very few of our cases treated medically claim a cure, but many of these patients had had five or six attacks before and had come to us because they did not get relief. Consequently, we can conclude that they were cases of deep seated ulcers that probably never will get complete relief from medical treatment alone. The surgeons often speak only of the mortality rate and not of the bad results otherwise. Jejunal ulcer may develop, a vicious circle may develop, and only about forty to sixty per cent of the cases are permanently relieved. They blame this on the medical men. This is wrong but I think we could help them if we would prepare their patients better for operation. I have been able to observe several cases under the fluoroscope that showed almost complete obstruction and pronounced dilatation. They should not be operated at this time. Under the Sippy method they improved markedly in a few weeks. Therefore, I think the medical man can help the surgeon improve his results by the proper cooperation.

DR. ARNOLD SCHWYZER, St. Paul: I have enjoyed this paper very much. We mostly hear only one side discussed, the medical or the surgical, and at that do not often enough hear of the late results. Surgeons claim very often that they frequently operate on cases after several medical "permanent" cures. So it is important that we come together and hear reports of what medical treatment can do, as well as surgery. We have not had many reports like this and I was anxious to hear what the essayist had to say. It shows that medical treatment has its place. As Dr. Wright has brought out, we cannot say absolutely what results we always are going to have, but most cases should have a thorough trial by medical means, before resorting to surgery.

Three years ago I reported our late results, here in Duluth. I have looked over those cases again There are not very many cases, but they date back from 3½ to 17 years. There were twenty-seven duodenal ulcers that I was able to trace. One died; he had a perforating ulcer backward into the pancreas. Another case had a gastro-jejunal ulcer after the operation and had to be re-operated. This makes two bad results among the 27 cases traced. Some had varying degrees of improvement and 15 were entirely well for these many years.

The percentage of surgical cures is better than what our medical friend selected from statistics. I think he gave us some statistics that are rather poor surgical results. If we summarize the whole thing, I think it is only fair that we give our patient a medical chance unless he comes with too severe suffering, or after long medical treatment. Those cases we do not attempt to treat medically, but every other case is given a trial. I do not belong to a surgical or medical clinic. Some of our patients come early in their disease and some late, but we never operate unless the patient was given conscientious medical treatment where it seemed of possible value. I have always stuck to the Leube dictum, that if after five weeks strict treatment in bed your patient is not well then it is a surgical case. I enjoyed hearing that there are also medical cures of long standing.

DR. L. L. MERRIMAN, Duluth: The discussion has been interesting and I enjoyed the paper very much. I believe a great deal of truth has been brought out this morning. I am glad to subscribe to what Dr. Martin said in regard to medical management, for I believe it has a very definite place in the treatment of ulcer.

I am free to admit that some cases are distinctly surgical first, those in which there is so high a grade of obstruction that the patient is likely to starve or reach a dangerous state of malnutrition before the medical management can get in its work; second, where you suspect carcinoma; third, in a few cases of pyloric obstruction where it is impossible to get cooperation between the patient and physician; fourth, in case of perforation.

I believe if the medical management is sufficiently intensive and the period of treatment sufficiently long; if proper attention is given to the presence of night secretion; and active foci of infection are removed, that a vast majority of cases of gastric and duodenal ulcer can be successfully treated by the internist.

APPENDICITIS, DIVERTICULITIS, AND ECTOPIC PREGNANCY WITH SPECIAL REFERENCE TO DIFFERENTIAL DIAGNOSIS*

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The term "acute abdomen" is now employed rather frequently in referring to pathology of obscure or undetermined origin, and easily includes all of the conditions named above. The relative frequency of these abdominal lesions offers sufficient reason for their consideration.

In a 3 mm. embryo, the stomach is seen as a spindle shaped enlargement anterior to the yolk sac, and the small intestine, as a straight tube, posterior to it. As further development continues the intestine grows in length much more rapidly than the abdominal cavity, and so of necessity becomes coiled. One primary loop is formed at the point where the yolk stalk is attached to it, and this loop projects into the celomic cavity of the umbilical cord.

A pouch-like outgrowth, on the side of the lower limb of this loop gives rise to the processus vermiformis and the cecum, which develop together. This outgrowth continues to enlarge at the point where the colon is joined by the small intestine, till a conical pouch is formed. However, the terminal portion of the outgrowth does not increase in size in proportion to the upper segment, and with subsequent development, the marked difference in caliber is seen between the cecum and the appendix vermiformis of the adult.

It is interesting to note, at a somewhat later period, the torsion of the intestine whereby the large bowel crosses in front of the small, and at a still later period the migration of the colon, which takes the cecum to the under surface of the liver where it remains till the fourth month after birth. It is the gradual elongation of the colon that causes the descent of the cecum with the appendix, to its normal adult habitat in the right iliac fossa. Failure to entirely complete this migration accounts for some of the anomalous positions of the appendix, sometimes seen.

The yolk-stalk is attached to the primary loop of intestine, mentioned above, at its most ventral portion as it lies in the umbilical celom. During the course of development this attachment normally disappears, but in from two to three per cent of cases it persists as an outgrowth, from the intestine, which is similar to it in structure and size and from 1 to 5 cm. in length. This outgrowth is usually found on the side opposite the mesentery, about 1 meter proximal to the ileocecal junction and is known as Meckel's diverticulum.

This diverticulum is of much surgical importance inasmuch as it often occasions complete obstruction, by its invagination into the lumen of the intestine. It likewise is subject to acute infection, with symptoms very similar to those seen in acute appendicitis.

Appendicitis is the most common of all abdominal lesions. It affects all classes of individuals, the very young, and the very old; but it is essentially a disease of young adult life. Its manifestations are fairly constant, but there is a wide variation in the symptoms in all types of cases.

The appendix normally lies in the right iliac fossa, but may be found in various parts of the abdomen. The most frequent anomalous position is near the under surface of the liver and this is explained by a failure in the elongation of the colon after birth. Occasionally the entire large bowel lies to the left of the median line, in which case the cecum and the appendix are found in the left iliac fossa. This position follows a lack of tortion of the large bowel in embryonic life.

The appendix is so situated that pathologic processes are easily developed; with a movable cecum above and a freely movable ileum mesially, a certain degree of fixation by its own mesentery, tension on its own blood supply is easily brought about. This tension easily produces congestion, and this stasis facilitates infection.

The appendix is a vestigeal organ without real function; therefore its power of resistance is lowered. Its opening into the cecum is unguarded, except for a very slight fold of mucosa which is not at all efficient. Its dependent position facilitates the passage of fecal material into its lumen. The disproportion of its length to the size of its lumen; its removal from the

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direct intestinal current; and the normal weakness of its muscle coats, all predispose to a stasis which is responsible for the large number of fecal concretions found within it.

The large amount of lymphoid tissue normally present in its mucosa facilitates rapid swelling and partial or even complete occlusion of the organ. This factor, together with others mentioned above, obstructs drainage; and obstructed drainage facilitates pathologic processes. It is always desirable to keep the appendix emptied.

Presence of fecal concretions causes epithelial necrosis and epithelial necrosis is usually followed by infection. This infection is usually introduced at the point of necrosis directly into the wall of the appendix. Some observers maintain however, that it may be of hematogenous origin and assert that it is a direct sequence of a tonsillitis, or some similar type of infection. However, this assertion needs more definite proof than has yet been brought forth. The usual organisms found are the bacillus coli, streptococcus pyogenes, staphylococcus aureus or albus, the pneumococcus and bacillus tuberculosis. In special cases foreign bodies may lodge in the appendix and they, like the fecal concretions, predispose to infection. Intestinal parasites not infrequently are found in the appendix.

These areas of infection are followed by necrosis of the surface of the mucosa with consequent loss of the epithelium. This is followed by infiltration of polymorphonuclear leucocytes. If the infection be not severe, small abscesses form within the appendiceal wall and these may rupture within and restoration of normal conditions follow; or they may rupture without and be followed by a localized or generalized peritonitis.

A continuation of the infective processes not infrequently results in a destruction of the normal tissues of the appendix and in replacement by connective tissue, and the appendix is then represented by a fibrous cord. In many cases the lumen of the appendix is entirely occluded in its distal portion or throughout its entire length.

In the early stages of an acute infection, numerous petechial hemorrhages are found in the submucosa, and this may be the only evidence of pathology if the appendix is removed in the very early stages of the disease.

Not infrequently the neck of the appendix is entirely occluded by the pressure of fecaliths. This occasions the retention of fluids within, and a complete destruction of the mucosa due to the increased tension.

Appendicitis.—The first symptom in acute appendicitic is *pain.* The pain is diffuse over the entire abdomen at first and is usually colicky in character. The superior mesenteric plexus of the sympathetic system supplies the appendix as well as the small intestine, and accounts for the diffuseness of the pain. In the early stage the maximum pain is in the epigastrium and very soon localizes in the right lower quarter.

Tenderness is now present at McBurney's point, which represents the base and not the tip of the appendix. Pain and tenderness vary in position according to the position of the appendix, which may point in any direction, from its base. It is quite possible in some cases to accurately prognosticate the position of the appendix, after a careful palpation of the abdomen.

Nausea and vomiting follow closely the incidence of the pain. The vomitng may be reflex, or due to reversed peristalsis. If reflex it soon ceases.

Muscular rigidity is rather constant. It is found in the rectus or the oblique muscles. When present, it does not always mean peritonitis, but may be due to irritation of the superior mesenteric plexus, which receives its communicating branches from the lower six intercostal nerves.

Murphy states that elevation of temperature is always present during the early course of the attack. That it is not always found may be due to inaccurate observation. Some rapidly fulminating cases, as proved by operation, show no initial rise of temperature at all.

Leucocytosis, varying from ten thousand to thirty thousand with a large preponderance of the polymorphonuclear type is usually present, and is dependable in a large percentage of cases. Given these symptoms, occurring in the order named and the diagnosis is not difficult. In some cases they are not so plainly manifest, so we must make, in the absence of the preliminary

chill and fever, a diagnosis with nothing but pain and leucocytosis present.

Complications are numerous. Among the most frequent is peritonitis due to rupture of the appendix, and subsequent abscess formation. Pus accumulations are found anywhere from the sub-phrenic area, on the right downward into the pelvis, and across to the region of the sigmoid. The abscess may be intraperitoneal and lie anterior to the cecum; it may be extra-peritoneal and lie behind the cecum. The abscess wall is frequently formed in part by coils of intestine which become matted together by a plastic exudate, the result of which may be a partial or a complete obstruction.

Thrombo-phlebitis of the mesenteric or iliac veins may occur and is a most serious complication, as it usually proves fatal.

Diverticulitis.—The diverticuli of the intestinal tract are of two kinds:

(a) Congenital (Meckel's),

(b) Acquired (usually found in the sigmoid, less frequently in the small intestine).

Acute diverticulitis of the congenital type may result from ordinary bacterial infection, the presence of a typhoid ulcer, a tuberculous infection, from torsion (followed by gangrene when the diverticulum is held by adhesive bands attached to its distal end) or the presence of foreign bodies.

The attack is very like acute appendicitis, from which it may be differentiated with the greatest difficulty, or not at all, in the early stage. Later when the symptoms of intestinal obstruction occur, the diagnosis is somewhat simplified. When perforation occurs, general peritonitis follows. The pain in diverticulitis, is nearer the median line than in appendicitis. It is usually above and mesial to McBurney's point, or it may be just below the umblicus. Muscular rigidity is found at the pain point. There may be blood in the stools, both macroscopic and microscopic. The presence of a pre existing umbilical fistula is also helpful in the diagnosis.

This condition may also be confused with intestinal obstruction. In diverticulitis, there is evidence of intra-abdominal inflammation, (pain, localized tenderness, rise of temperature, leucocytosis, muscle rigidity), while in obstruction the obstruction itself is the most prominent manifestation.

Acquired diverticulitis presents quite a different picture. Congenital diverticulitis is usually found in children or young adults, while acquired diverticulitis is a disease of older age. It is usually found in the sigmoid, and is due to ulceration of the mucosa by hardened feces, followed by infection and all the pathologic changes, due to a process of that kind.

Differential diagnosis must be made from carcinoma, and this may require the microscopic examination of the involved tissue; from chronic inflammation of the sigmoid; from appendicitis in the left inguinal region; from salpingitis; and from tuberculous involvement. The diagnosis is difficult, and often requires an abdominal section to complete it.

The differential diagnosis of appendicitis is a most interesting, and sometimes a most difficult problem to solve. Differentiation must be made from lesions in the upper abdomen, namely:

1. Perforation of gastric or duodenal or intestinal ulcer.
2. Acute cholecystitis.
3. Cholelithiasis.
4. Pyelitis or perinephritic abscess.
5. Nephrolithiasis.

Sudden perforation of the gastro-intestinal tract from ulcer, or other cause, is often confusing and offers marked difficulty in differentiation, so similar are the manifestations. A carefully elicitated history of the patient's previous condition should be of great assistance in such cases.

In the lower abdomen, differentiation must be made from, namely:

1. Chronic inflammation of cecum.
2. Tuberculous inflammation of cecum.
3. Intestinal tuberculosis.
4. Acute cystitis.
5. Acute inflammation of ureter.
6. Typhoid ulceration.
7. Salpingitis.
8. Twisted tumor pedicle.
9. Diverticulitis.
10. Carcinoma of cecum.
11. Stone in the ureter.
12. Intestinal stone.

13. Right sided pneumonia.
14. Developing herpes zoster.
15. Intestinal fermentation (acidosis).
16. Ectopic pregnancy.

In women acute right salpingitis presents grave difficulty in diagnosis, and where the appendiceal involvement is primary, with its tip attached to the ovary or tube, or where the tube is first involved, with secondary inflammation in the appendix, an absolute diagnosis may be quite impossible. There are other perplexities, but it is not necessary to go into detail with all these conditions for a mere mention of them is sufficient to remind us that great care and sufficient deliberation be used in arriving at correct conclusions.

Ectopic pregnancy is usually recognized from its well known symptoms, among which are:

1. Cessation of menstruation together with nausea, and other usual symptoms of normal pregnancy.
2. Sudden onset of pain in one side of the pelvis, and a repetition of the pain at intervals.
3. Bloody vaginal discharge simulating a menstrual period with irregular recurrences of the same.
4. A tender, rounded mass beside the uterus. A gradual enlargement of this mass.
5. Decidual cells cast off from the uterus or demonstrated in scrapings.

When these symptoms obtain, a positive diagnosis is readily made. It becomes necessary in many instances to differentiate the condition from a chronic salpingitis with an acute exacerbation, where we find a tender mass, gradually enlarging, a slight degree of fever, and some menstrual irregularity. This problem is especially difficult of solution where the pyosalpinx gradually enlarges, the pain increases, then becomes suddenly sharp and severe, followed by rupture of the tube and collapse of the patient due to an abdomen full of pus.

Again the diagnosis may not be clear, if we are dealing with a ruptured true or false corpus luteum with hemorrhage. If it be a true corpus luteum, abortion will supervene, together with the discharge of placental tissues, but if a false corpus, there will be a premature menstrual flow, and no placental tissue. Where the ectopic pregnancy is in the end of the right tube, being absorbed or expelled, it may easily be confused with an acute appendicitis. Where a chronic inflammation of the appendix exists together with a cystic right ovary, gradually increasing in size, a positive diagnosis is difficult.

Further differentiation must be made from perforation of the stomach, biliary colic, ureteral calculus and small intramural or submucous leiomyomata of the uterus. Diagnosis before rupture is rather infrequent, but is greatly facilitated after rupture and hemorrhage into the ovum or the tube.

During the past few years the recognition of hyperalgesic areas has given valuable aid in making more accurate diagnosis of intra abdominal conditions. It is now well recognized that pathologic conditions of deeply situated organs in the abdomen give rise to corresponding tender areas in the skin and superficial tissues.

By the use of local anesthesia opportunity has been afforded to definitely prove that there is no pain in the abdominal viscera due to handling, but immediately that peritoneal attachments are put under tension, the patient complains of severe pain. These organs do not possess ordinary sensation, but the pain elicited by trauma is due to a viscerosensory reflex and is referred to the overlying superficial structures. This viscerosensory are comprises afferent impulses from the viscus to the spinal cord and efferent impulses from the spinal cord to the body wall.

When an organ is involved by an infective process, an irritable focus is established in the spinal cord; hence, a stimulus applied to the corresponding area of the body surface, gives rise to an abnormal response, and the patient complains of pain. This is what is meant by an hyperalgesic area, and when carefully sought, gives most definite and positive information as to the pathologic conditions of corresponding viscera in a large percentage of cases.

These hyperalgesic areas are divided into two groups, the lateral, and the mesial. Among the lateral, are the gall-bladder, the appendiceal, and the tubal areas, while the gastro-duodenal, the large and the small gut areas are in the mesial group. When carefully determined, they offer most valuable aid in the differentiation of acute abdominal conditions involving

mucosal or submucosal tissues. Early observation of these acute lesions is desirable, and of much assistance in arriving at a right diagnosis.

With intelligent, careful and painstaking observation and examination of each patient, these conditions usually will be recognized correctly, and many unnecessary surgical operations will be avoided.

A STUDY OF THIRTY-FOUR CASES TREATED BY EPIDURAL INJECTIONS AND REMOVAL OF FOCI OF INFECTION TREATMENT OF SCIATICA*

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The results of treatment by epidural injections of saline solution containing novocain and the removal of foci of infection in thirty-four cases of sciatica observed in the Mayo Clinic during a period of two and one-half years form the basis of this study.

I have not attempted to classify the cases into sciatic neuritis and sciatic neuralgia, for such a classification is not always possible. Cases in which the sciatic pain could be attributed definitely to some bony condition and cases in which doubtful diagnoses were made have been eliminated from the report.

TABLE 1.

PRINCIPAL SYMPTOM: PAIN

	Patients
Sciatic nerve distribution (100 per cent)	34
Sacro-iliac region (94 per cent)	32
Lumbar region (same side)	27
More or less constant	20
Definite attacks with free intervals	14

POSSIBLE ETIOLOGIC FACTORS

	Patients
Strain or wrench of back	9
Acute infection	6
Exacerbation of sciatica (chronic cases) with colds	5
Occupational	3

PHYSICAL AND ROENTGENOGRAPHIC FINDINGS

	Patients
Lasegue's sign positive (94 per cent)	32
Tenderness over trunk of sciatic nerve (88 per cent)	30
Achilles' reflex diminished or absent (50 per cent)	17
Atrophy of muscles or affected extremity (38 per cent)	13
Some limitation of motion in the spine	9
Hypertrophic arthritis of the lumbar spine	3
Sacro-iliac disease (?)	2
Hypertrophic arthritic hip	1
Lesion of fourth and fifth lumbar vertebrae (character doubtful)	1
Old healed fracture of the femur	1
Sacralization of the fifth lumbar vertebrae	1

It will be noted that pain along the sciatic nerve is the most common subjective symptom, being present in all the cases. Pain in the sacro-iliac region was present in 94 per cent of the patients, backache on the same side in 68 per cent, and backache on the opposite side in 29 per cent. Bilateral sciatica was present in two patients (6 per cent). Tenderness over the sciatic trunk was a constant objective finding.

The bony changes were not marked; in none of these cases were they demonstrated to be a cause or a factor in producing the sciatica.

After all the palpable causes of sciatica, such as malignant growths pressing on the lumbosacral plexus, subluxation of the sacro-iliac joint, syphilis, diabetes mellitus, pelvic tumors, and so forth, have been eliminated, there still remains a large group, perhaps the larger group of cases of sciatica, in which infection must be looked on as the cause of the pain. The exact seat of the pathologic process is not always determinable. Dejerine and his school classify sciatica into neuritis of the trunk and neuritis of the roots. The fact that 94 per cent of the patients experienced pain over the sciatic distribution down the affected leg during the epidural injections, and not on the opposite side, is evidence that either the roots or the ganglia were hypersensitive compared with those of the unaffected side. The pressure of the fluid can come in contact only with the root covered by the fold of the dura, or with the ganglia in the foramina and slightly beyond, as was shown by dissection of a recently dead body in which 60 c. c. of methylene blue were injected into the epidural space. The fluid passed epidurally to the upper cervical region. In fact, there was as much fluid in the cervical region as in the lum-

*Presented before the Southern Minnesota Medical Association, Winona, Minn., June 1921.

bar region. The fluid passed to the outer edge of the ganglia to the point where the dorsal nerves are given off, but slightly farther distally in the sacral region. None of the fluid reached the subdural or subarachnoid spaces. Were the inflammation located exclusively distal to the ganglia, pain from the pressure of the fluid only should not be experienced down the affected leg. Interstitial fibrosis and thickening of the sheath of the sciatic trunk have been described, but I have been unable to find reports of careful histologic studies of the roots and ganglia in patients with sciatica coming to necropsy. As yet knowledge of the pathologic changes and the location of the lesion in the so-called idiopathic sciatica is incomplete. In view of the fact that the greater percentage of the cases in this series were probably caused by infectious processes either directly affecting the roots, ganglia, or trunk of the sciatic nerve, or by toxic products from infection elsewhere in the body which caused deleterious changes in some of these structures, it is considered important to remove all possible foci of infection. Fourteen of the thirty-four patients had infected tonsils for which tonsillectomies were performed. Twenty-three patients had foci of infection around the teeth and the teeth were removed, or removal was recommended.

The technic of epidural injection for sciatica is simple. It has been described quite fully by Cathelin, Strauss, and others. A 10 c. c. Luer syringe with an ordinary spinal puncture needle is used. The needle is introduced into the sacral canal for from 5 to 6 c.m. Care is taken not to introduce it farther, since there is danger that the spinal subdural space may be entered because of the reflection in most persons of the the dural sheath around the upper margin of the second sacral vertebrae. After the introduction of the needle, the trocar is removed and suction made with the syringe in order to be sure that no cerebrospinal fluid escapes. If it does, the needle is withdrawn for 2 or 3 cm. The solution used in the Mayo Clinic usually is 0.5 per cent novocain in physiologic salt solution. The solution is introduced very slowly; for from ten to twenty minutes is necessary for the injection of from 40 to 50 c. c. Ordinarily 50 c. c. is sufficient. The injections may be repeated every forty-eight hours if relief is not obtained. At times seven or eight injections may be required. It has been our experience that after the first injection the pain is in most cases relieved entirely for from two to three hours and ameliorated for the next two to ten days, and the patient enjoys a full night's rest.

Of the thirty-four patients treated by epidural injections, fourteen received one injection, thirteen two injections, four three injections, two four injections, and one five injections. Nine patients received complete and permanent relief; fourteen received partial relief, which allowed them to return to work; eleven did not receive any permanent benefit from the injection. Temporary relief, that is, for from two days to two weeks, either complete or partial, was obtained by thirty-one patients.

In the greater number of cases foci of infection were removed, either a few days prior or subsequent to the injection; this was probably an occasional factor in the cure. Table 2 gives the relation of eradication of the foci to the results; the data are of interest, but definite conclusion can not be drawn from them.

TABLE 2

RELATION OF ERADICATION OF FOCI TO RESULTS

Patients with permanent relief	9
Foci of infection removed in	5
Patients with partial permanent relief	14
Foci of infection removed in	11
Patients without permanent benefit	11
Foci of infection removed in	5
Patients in whom foci were removed	21

While our results are not entirely satisfactory and as yet we do not know what part the injection plays and what part the removal of foci plays in bringing about the beneficial effect, we believe that the procedure is justified in selected cases of sciatica.

SUMMARY

In thirty-four cases of sciatica in which a definite removable cause could not be found, the removal of possible foci of infection in 62 per cent combined with repeated epidural injection gave a permanent cure in 27 per cent, and permanent amelioration of symptoms; in 40 per cent, the patients were able to continue their occupation with a fair degree of comfort. Thirty-three per cent did not obtain permanent beneficial results.

DISCUSSIONS

A MEMBER: In 32 of these cases I understand

there was sacroiliac pain, and stretching of the nerve gave pain in 34 cases. I would like to ask if in simple sacroiliac disease bending of the thigh upon the hip with the knees straight does not give pain in many instances.

DR. OTT: It does in sacroiliac disease.

DR. H. W. MEYERDING, Rochester, Minn. It has been my good fortune to examine many of the patients reported by Doctor Ott in this series; they had come to the orthopedic section of the Mayo Clinic for an examination. It would seem that the important points are to determine the etiologic factor and to relieve the patient of pain. Many of our patients with sciatic pain have a history of sacroiliac strain followed in several weeks by pain along the sciatic nerve; later, there is listing to one side or the other with flexion of the spine and lumbar muscle spasm. Many are relieved by strapping of the back with adhesive about the pelvis, the wearing of a sacroiliac belt, application of a body cast, rest, or Buck's extension to both legs and a small pillow under the back. It has been my observation that some patients have been relieved by the epidural injection when other methods have failed to give benefit, and I believe it is a valuable method of relief of pain even if the injection must be repeated in patients who have suffered much and required opiates, and so forth for relief. In this series I believe most of these measures have been tried without success. Hypertrophic arthritis of the spine and sacroiliacs should be considered as a frequent cause of secondary sciatica which will last until fusion of the joints or until the inflammation has subsided. All foci of infection should be eradicated in addition to whatever other treatment is applied.

THE VITAL CAPACITY OF THE LUNGS IN CARDIAC DISEASE*

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After an individual takes into his lungs as much air as he possibly can, the amount which he then expires by the deepest possible expiration is his vital capacity. The vital capacity is composed of three elements; tidal air, complemental air and supplemental air. (Fig. 1) Tidal air is the air that enters and leaves the lungs with each respiration at rest. Complemental air is that amount which can be taken into the lungs over and above the normal inspiration. Supplemental air is the air which can be given out after the normal expiration. The vital capacity is the total of these three. Even after all the air has been expelled from the lungs by the deepest possible expiration, there still remains a volume of air which it is impossible to remove. This is called the residual air. It is only within the recent years that the relation of changes in these volumes of air to pathologic conditions has been studied.

There is a wide variation among normal healthy individuals in the volume of air which can be expired after the maximum inspiration. In order then for vital capacity studies to be of any value is disease, there must be standards for the determination of the normal vital capacity. The variations in normal vital capacity depend chiefly on two factors; (1) sex, and (2) certain body measurements. Hutchinson[1] in 1846 with his invention of the spirometer, made an extensive study of the vital capacity of normal individuals. He concluded that the vital capacity varied more closely with height than any other body measurement. There has been considerable criticism of Hutchinson's work on the basis that the variation for each height is too great. In 1917, Peabody and Wentworth[2] studied the vital capacity of 140 normal individuals. They concluded that a classification based on height and sex was sufficiently accurate. They divided each sex into three groups according to height and determined the average vital capacity for each group. Later Lundsgaard and Van Slyke[3] made a thorough and complete study of this problem. Their conclusions were that the logical measurements to use were those which would determine the chest volume. They considered the chest as a geometric figure of three dimensions and calculated its volume from the product of these. They established, from their observations, certain constants by which the vital capacity could be calculated from the chest volume. Still more recently, Georges Dreyer[4], in an extensive study of this subject, brought forth several formulae for the calculation of vital capacity. He showed that there was a relationship between vital capacity and various body dimensions, but decided that it could be most accurately estimated from the body surface. Two other studies of this subject have appeared in the last two years. West[5] made a study of 120 normal individuals comparing the several standards and concluded that a standard based on body surface was most exact, and in cases in which the weight could not be obtained, a standard based on height alone was sufficiently accurate. Myers[6] simplifies the determination of the normal vital capacity for the clinician, by presenting a table of figures giving the vital capacities for any weight from 100 to 200 pounds as calculated by Dreyer's formula. He also produces two empirical formulae for men and women, which he believes sufficiently accurate for clinical use.

With standards established for the determination of the normal vital capacity, attention has been turned to the study of the vital capacity of the lungs in pathological conditions. Several investigators[2 7 8], have made studies of the vital capacity in cardiac disease, and it has been found definitely reduced especially in those cases in which dyspnea was a symptom.

It was thought that a further study might be of value, with especial reference to the practical application of vital capacity studies in heart disease. This study was made on 120 cases. An attempt was made to correlate the clinical findings in each case with the vital capacity. The cases were analyzed clinically from the history, physical findings, and laboratory data. In practically all cases, there was

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also a roentgenogram of the heart and electrocardiogram. From these data, a diagnosis of the lesion was made, and an estimation of the cardiac function was attempted. In the history, the following were gone into carefully: (1) the question of exertion dyspnea; (2) the ability of the patient to carry on his work; and (3), the degree of limitation of activities necessary. The vital capacity was determined in each case by means of a calibrated gasometer. The patient was directed to fill his lungs as completely as possible and then expire completely into the gasometer. Several determinations were made and the highest reading considered as the vital capacity. Usually after one or two attempts, the readings remained remarkably constant. Readings were taken with the patient rested and several hours after a meal, although the presence of a moderate amount of food in the stomach does not seem to alter results. Most of the subjects were ambulant cases and readings were taken with the patient standing; while in those confined to bed, the readings were made in the position most comfortable for the patient. Although it is a relatively simple matter to take a vital capacity reading, certain errors may arise. The patient may not co-operate properly, and thus not use his maximum effort either in inspiration or expiration. Others attempt an additional expiration after their final effort. These sources of error were carefully watched for, and questionable readings were not used. It might be mentioned here, that the procedure seems to have no ill effect on the subject even in those severely disabled. The normal vital capacity in each case was estimated from the standards of West; (1) because the necessary measurements are easily obtainable; and (2) because the investigations of both Dreyer and West agree that vital capacity varies more closely with body surface than any other dimension. The body surface in square meters can be easily determined from the height and weight by the graphic formula of DuBois and DuBois[9]. The vital capacity is then calculated by multiplying this figure by 2 in females and by 2.5 in the case of males. The result is in liters of air. For instance, if the body surface were found to be 1.6 square meters, the calculated normal vital capacity would be 3.2 liters for a female and 4 liters in males.

Of the 120 cases studies, 96 were ambulant cases under observation in the cardiac division of the outpatient department. They were, with a few exceptions, in a good state of cardiac function, representing the type of patient who might be seen in a physician's office. The remaining 24 were patients who were confined to bed for various periods of time, and were studied in the wards of the General Hospital. There were approximately 200 observations made on the entire series. In the group there were 71 males and 49 females with the ages varying from 16 to 73. The largest proportion of the cases however, were under 50 years of age. The patients were referred to the cardiac clinic, either because of symptoms referrable to the heart, or because of suspicious signs observed elsewhere. It might be emphasized, that in all cases, a cardiac lesion was suspected. However, of the 120 cases, cardiac disease was found in only eighty-four. In the remaining thirty-six, there was no cardiac pathology found. Most of these were diagnosed as neurasthenia, effort syndrome or cardiac neurosis.

A comparison of the findings in the two groups is of interest. In the cardiac group, the vital capacity readings varied from 900 c.c. to 4200 c.c. For this group, the normal vital capacity, as estimated from body surface, varied from 2480 c.c. to 5425 c.c. In the non-cardiacs, the vital capacity readings varied from 1800 to 5300 c.c. The estimated normal vital capacity for this group varied from 2680 to 4925 c.c. Figures 2 and 3 show the distribution of the cases in each group as compared with the calculated normal figures. It is clear that in the cardiacs, the vital capacities as read on the gasometer are definitely reduced as compared with the calculated normal figures. In the non-cardiacs, there is a much greater approximation of the two curves. The lower figures in the non-cardiacs are in cases of marked obesity in whom a reduced vital capacity is to be expected. That a definite reduction of vital capacity is present in the cardiac group is also shown by a comparison of the average figures in each group. In the cardiacs the average reading was 2303 c.c. as compared with an average calculated figure of 3842 c.c. In the

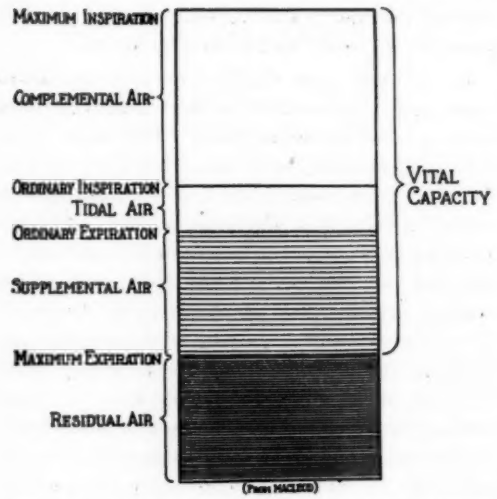

Fig. 1. Graphic representation of lung volumes, (from Macleod).

non-cardiacs the average vital capacity reading was 3586 c.c as compared with the average estimated normal figure of 3938 c.c. In each case, the percentage of the normal vital capacity was calculated. The lowest cardiac reading was 23.2 per cent of the estimated normal for that case. The highest was 95 per cent of the normal. The lowest non-cardiac reading was 60 per cent of the normal, and the highest 122.4 per cent. The average per cent of the normal vital capacity in the cardiac group was 59.04, in contrast to 84.4 per cent in the non-cardiac. There is then, a very definite reduction in vital capacity among the cardiacs, and when it is remembered that the largest number of these cases were ambulatory and fairly well compensated, it is evident that cardiac impairment is accompanied by reduction in vital capacity which is neither slight nor questionable, but very definite and unmistakeable. In the non-cardiac, there is also a slight

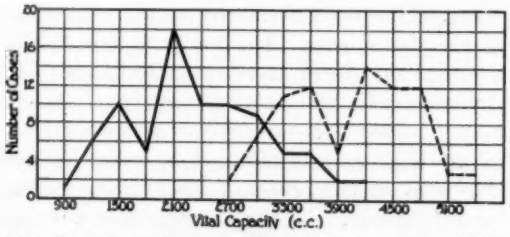

Fig. 2. Comparison of actual vital capacity (solid line) and estimated normal vital capacity (broken line) in the cardiac group.

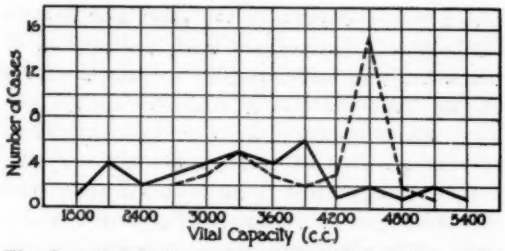

Fig. 3. Comparison of actual vital capacity (solid line) and estimated normal vital capacity (broken line) in the non-cardiac group.

reduction. It must be remembered however, that these cases were not really normal individuals but had some impairment of general health, and furthermore, a number were very obese individuals, in whom a reduction is also to be expected. Figure 4 illustrates graphically the comparison of the vital capacity in the cardiacs and the non-cardiacs.

In attempting to correlate the vital capacity with the presenting symptoms, one finds that by far the most common symptom in the cardiac group is dyspnea on exertion. In the cardiacs, 62 of the 84 cases or 73.8 per cent complained of varying degrees of dyspnea. In the non-cardiacs, 11 or 30.5 per cent complained of this symptom. It is interesting to compare the vital capacities of the cases in each group, complaining of dyspnea. In the cardiac group, there was a definite reduction of vital capacity, and the greater the degree of dyspnea, the greater the reduction in vital capacity. It is worth while emphasizing that there was not a single case among the cardiacs complaining of dyspnea, which did not have a definite reduction of vital capacity. This finding is of great importance, as it may serve as a means of differentiating cardiac dyspnea from other forms of respiratory distress. In the non-cardiacs, on the other hand, although dyspnea was complained of, a vital capacity within the normal limits was found in practically all cases. In a few cases a reduction was found, but this occurred either in cases suffering from muscular asthenia or in obese subjects in whom such a finding is to be expected. In the cardiacs suffering from dyspnea, the average reading was 53.4 per cent of the normal as compared with 77.8 per cent in the non-cardiacs.

An attempt was also made to correlate the vital capacity with the anatomical lesion of the

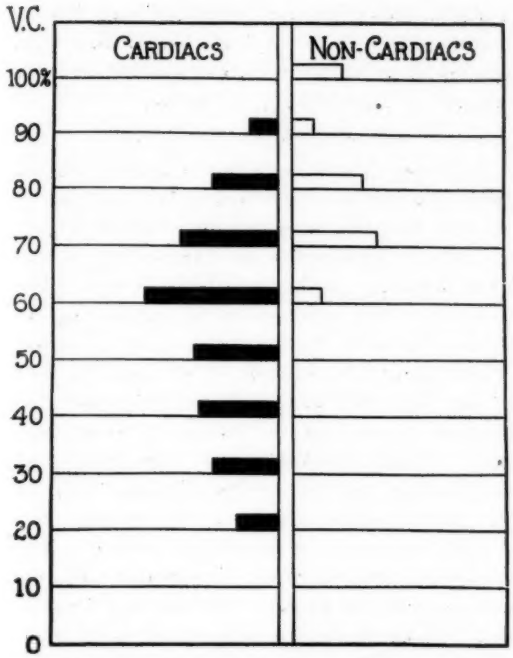

Fig. 4. Comparison of vital capacities by percentage of normal in cardiacs and non-cardiacs. Length of bars indicate the number of cases.

heart. Although practically every type of cardiac lesion was represented in the series, there is apparently very little relation between the vital capacity reduction and the type of pathologic change. However, when the heart is studied not from the standpoint of anatomical damage but from the disturbance in function, a close relation is found to exist between impaired cardiac function and the vital capacity. Clinically, we are accustomed to the accept the tendency to dyspnea on exertion as the earliest sign of functional disturbance of the heart muscle. This is the most constant and reliable evidence of a damaged heart, and the best test of heart function that we possess at the present time, is a careful history with especial reference to the degree of limitation of activities that is necessary, and a close investigation into the tendency to dyspnea. When the cardiac function is estimated by these criteria and compared with the vital capacity, a strikingly close relationship is found.

In the cardiac group of eighty-four cases, there was a wide variation in the degree of functional disturbance of the heart, and likewise a wide variation in the degree of vital capacity reduction. The highest vital capacity reading was 95 per cent of the normal estimated figure, and the lowest 23.2 per cent of normal. The most marked vital capacity reductions were accompanied by evidences of definite cardiac impairment while, as the readings more closely approach the normal, the history pointed to a heart in good functional condition. Of the eighty-four cardiacs, an estimation of the function of the heart was attempted in eighty (Fig. 5.) Of these, seven had a vital capacity of 30 per cent of the normal or less. All of these cases were acutely decompensated. All were confined to bed, and in every case, dyspnea was present even at rest. Sixteen cases had a vital capacity between 30 and 50 per cent of the normal. Five or about one-third of these were in bed. All showed

	% of Normal Vital Capacity				
	20-30	30-50	50-70	70-80	80+
Number Cases	7	16	28	17	12
% in Bed	100	31.2	7.4	—	—
% Unable to Work	100	87.5	21.4	5.8	—
% Very Light Work	—	12.5	42.8	41.1	25
% Work Slight Restriction	—	—	28.5	41.1	50
% Normal Work	—	—	7.4	11.8	25

Fig. 5. Table showing the relation between the reduction in vital capacity and functional efficiency of the heart as estimated from the patient's history.

dyspnea on very slight exertion and many had edema of the ankles. Of the eleven who were not confined to bed, nine were unable to do any work. In two cases or 12.5 per cent, light housework was attempted, but even this slight exertion brought on dyspnea. Twenty-eight cases had a vital capacity between 50 and 70 per cent of the normal. Of this number, two or 7.4 per cent were confined to bed. Six or 21.4 per cent stated that they were unable to carry on any of their work, and in two cases or 7.4 per cent, no limitation of activities seemed to be necessary. The remaining twenty stated that they were attempting to carry on

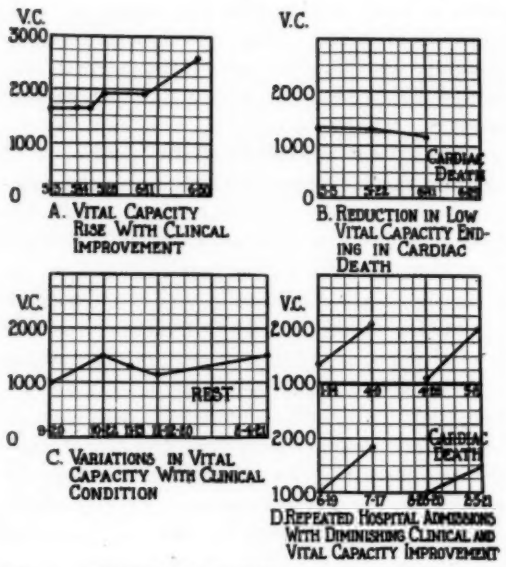

Fig. 6. Concomitant variation in vital capacity and clinical condition in cardiacs.

their work, but that they found that a definite limitation of the activities was necessary, twelve or 42.8 per cent being able to do only very light work, while the remaining eight or 28.5 per cent claimed that only a minor degree of restriction was necessary. In the histories of these patients, such statements as "able to work but tire easily", "can do light housework but no washing", "are comfortable when walking on level ground, but become short of breath on climbing", "able to do their work, but must do it slowly", and similar complaints were common. All these indicate that a definite cardiac impairment was present. There were seventeen cases having a vital capacity between 70 and 80 per cent of normal. There was not a single case confined to bed. Of the group, one or 5.8 per cent were unable to carry on any work. Seven or 41.1 per cent could do but very light work, and seven or 41.1 per cent could do work with but slight restriction, and in two cases, or 11.8 per cent, the normal amount of work was tolerated, without any discomfort. There were twelve cases with a vital capacity above 80 per cent of the normal. All were in good state of compensation and all were able to carry on work of some form. Three cases or 2 per cent were able to do light work only; six or 50 per cent found that only a slight restriction was necessary, and the remaining three or 25 per cent claimed they were able to carry on their normal amount of work without any distressing symptoms.

THEORETICAL CONSIDERATION

Although it is evident that in cardiac disease there is a definite reduction in the vital capacity, and that this reduction parallels the degree of cardiac impairment, the explanation of this phenomenon is still somewhat obscure. The problem is best approached by considering the factors involved in the mechanics of normal respiration. The passage of air into and out of the lungs depends on the fact that both the thoracic cavity and the lungs can alter their size. During inspiration, the enlargement of the thoracic cavities produces a diminution in the intra-thoracic pressure. Air rushes into the alveoli under atmospheric pressure, distending the lungs. Since the alveolar walls are elastic, after being stretched during inspiration, during expiration they return to their original size. The maximum volume of air that can be taken into and passed out of the lungs depends then first, on the ability of the thorax to alter its size, and second, on the ability of the lungs to expand and contract correspondingly. The vital capacity can thus be influenced by changes in any of the tissues involved in the respiratory movements, i. e. (1) anything interfering with the normal enlargement of the thorax, and (2) anything reducing the normal movement of the lungs. Those affecting the thoracic mobility are deformities of the chest, ossification of the costal cartilages, weakness of the respiratory musculature and increased abdominal pressure, such as may be due to air, fluid, or tumors. Those limiting the movements of the lungs may be tumors, air or fluid in the pleural cavity or changes in the lungs themselves, such as acute or chronic inflammations, tumors, emphysema or bronchietasis.

In the majority of cardiac cases however, all these factors can be ruled out as the cause of the reduced vital capacity. Since a reduced vital capacity in cardiac disease is associated with impaired cardiac function, the mechanism of this reduction may be found in the effect of cardiac impairment upon the tissues concerned in the respiratory activity. The earliest changes occurring in practically all cases of

impaired cardiac function is a disturbance in the pulmonary circulation. There is a stasis and resultant increased pressure in the pulmonary vessels, with engorgement of the capillaries entwining the alveoli of the lungs. These capillaries constitute a considerable part of the alveolar walls, and it is conceivable that changes in them may affect the normal expansibility and elasticity of the alveolar tissue. That these changes do occur as the result of pulmonary congestion following cardiac impairment, has been concluded by v. Bash[10] from a series of carefully conducted experiments. He believes that as a result of the stasis and increased pressure in the capillaries of the lung, there is a condition of "lungen--starre" or lung-rigor produced. In other words, with changes in the pulmonary circulation resulting from impaired heart function, there is a definite physical change produced in the alveolar wall, reducing the normal expansibility and elasticity of the lung. Siebeck[7] first suggested that the reduced maximal respiration in cardiacs depended on alveolar fixation due to altered pulmonary circulation. Heretofore, as pointed out by Mackenzie we have been accustomed to consider rales at the bases of the lungs as one of the earliest evidences of cardiac decompensation. This phenomenon is also due to chronic passive congestion of the lungs, but occurs only when considerable engorgement of the alveolar capillaries has occurred, and fluid exudes into the aveoli. A reduction in vital capacity, although an expression of the same engorgement process occurs, however, at an earlier stage, and may therefore be taken as an earlier evidence of cardiac impairment.

PRACTICAL APPLICATIONS

The value of any clinical test may be judged by the relation between the simplicity of its application, and the resultant information obtained. The determination of the vital capacity, although a very simple procedure, apparently gives reliable clinical information, which is of at least as much value, as that obtainable by any other single method of studying the heart. As a result of this study, we have, during the past eighteen months, attempted to employ vital capacity determinations routinely in the study of cardiac cases, and have found it of definite value in diagnosis, prognosis and as a basis for treatment. However, we wish to emphasize the point, that the vital capacity in any given case is of little value except in conjunction with all the other clinical findings. Furthermore, before any significance can be attached to the interpretation of a vital capacity reading, we must first eliminate all non--cardiac causes of reduced vital capacity. Most of these are fairly obvious and can be found easily on routine examination. Deformities of the thorax, ossification of the costal cartilages, or general muscular asthenia affecting the muscles of respiration can reduce the vital capacity. Resistance to the expansion of the lungs by fluid, air or tumor in the pleural cavity, must be ruled out. Changes in the lung tissue, due to tuberculosis or emphysema, must be considered, as well as abdominal conditions, such as the presence of gas, fluid or tumors which interfere with the diaphragmatic movements. Obese individuals tend to have a reduced vital capacity, probably because of increased intra-abdominal pressure, as well as flabby respiratory musculature. As a rule there is little difficulty in determining whether or not any of these factors are playing a part in the reduction of a vital capacity; and when these have been ruled out, it has a definite cardiac significance.

As an aid in diagnosis, we have found the determination of the patient's vital capacity of value in two different types of cases. In the first place, in an individual presenting symptoms which might be referable to an impaired cardiac function, the vital capacity assists in determining whether or not any cardiac involvement is present. Secondly, in cases in which the presence of a cardiac lesion is definitely known, it gives a farily accurate index of that most important phase of cardiac diagnosis, the functional capacity of the heart.

As examples of the first group, we have found in practically all patients with dyspnea, palpitation or edema, but with normal vital capacities, that no cardiac pathology was present. In other words, a normal vital capacity in the presence of dyspnea and palpitation practically rules out a cardiac condition as their cause. Thus, Adams and Sturgis[11] studying the vital capacity of one hundred soldiers in

the "effort-syndrome" group who complained of dyspnea, found no reduction of vital capacity. These patients of course were known to have no disturbance of cardiac function. We might cite an instance of a case of apparent cardiac dyspnea, where the impression of the absence of cardiac pathology was confirmed by study of the vital capacity. This patient was a young man who had suffered two attacks of acute rheumatic fever, during which, attention was called to his heart. He came into the hospital apparently in great respiratory distress, with dyspnea even when propped up in bed. Although his symptoms were so marked that a physician had previously attempted a paracentesis pericardii, his pulse-rate was normal and there was no cyanosis. Despite his severe dyspnea, a practically normal vital capacity was found. No cardiac pathology could be demonstrated, and a diagnosis of cardiophobia was made, largely on the basis of his normal vital capacity. Ultimately, the patient recovered completely under reassurance and suggestion.

It is in the second group of cases, that is, in patients in whom cardiac disease is definitely present, that the application of vital capacity determinations have their greatest diagnostic value, in that they seem to give an index of the functional capacity of the damaged heart. Peabody and Wentworth[2] found that the vital capacity reduction closely followed the clinical condition of the patients, varying directly with the degree of cardiac impairment. An analysis of our series confirms their findings. In the cases where the heart was well compensated, the vital capacities were within normal limits. In those cases, in whom a careful analysis of the history showed that a limitation of activity was necessary, the vital capacity was reduced, and in practically all cases, dyspnea was present when their activities increased beyond the safety point. The lowering of vital capacity followed quite closely the reduction in cardiac function. The reduction of the vital capacity gives an index of the functional state of the heart, provided extra-cardiac factors affecting the vital capacity are ruled out. In many cases in which the history, physical findings and laboratory data have left us undecided as to the cardiac condition, the vital capacity reduction greatly aided us in estimating the degree of cardiac functional impairment. To sum up, the vital capacity is of value in diagnosis, first, in determining the presence or absence of a cardiac lesion, and secondly in indicating the degree of functional impairment where cardiac pathology is known to be present.

As to prognosis, it may be said that as a rule the lower the vital capacity, the poorer the prognosis. There are exceptions however. There are cases acutely decompensated with a very low vital capacity who improve with a corresponding rise in vital capacity until it may reach a figure approaching the normal. On the other hand, other cases may present a vital capacity but slightly reduced and yet by other methods of diagnosis, such as the electrocardiograph, there is evidence of a cardiac lesion accompanied by a grave prognosis. In these cases while giving an index of cardiac function at the time, the vital capacity does not give an accurate prognostic estimate of the future cardiac course. More accurate conclusions as to prognosis can be drawn from repeated readings giving an indication of the response of the heart muscle to treatment. This of course, is of the greatest significance in prognosis. The greater the increase of vital capacity under treatment, the greater is the degree of cardiac recovery indicated. In the few cases in whom a greatly reduced vital capacity did not improve under treatment, the ultimate outcome was usually fatal. (Fig. 6-B.) J. B. is an example of a case whose prognosis could be based upon repeated vital capacity studies. He entered the hospital on four different occasions with his heart decompensated. On each occasion, his clinical and vital capacity improvement was diminished. On his first admission his vital capacity was 1300 c. c. After eleven weeks, it rose to 2100 c. c. At this time he was very much improved clinically. He left the hospital, but found it necessary to return. On his second admission, his vital capacity was 1100 c. c. On this occasion it rose in response to treatment to 2000 c. c. He was again discharged, but returned on his third admission with a vital capacity of 1000 c. c., which rose after four weeks to 1800 c. c. On his fourth admission, he entered with a vital capacity of 1000 c. c., which never rose above 1500 c. c.

His heart showed a poorer comeback on each admission, finally ending in a cardiac death. (Fig. 6, D.)

Possibly the greatest aid which vital capacity determinations give, lies in its relation to treatment. It (1) gives us a measure of the results of treatment; (2) indicates the maximum point of response to treatment; (3) establishes a cardiac tolerance at this point, and (4) shows whether this cardiac tolerance for work is increasing or diminishing. As the patient improves under treatment, his vital capacity rises, until a maximum point is reached, at which the readings become stationary (Fig. 6, A). This point indicates the greatest degree of recoverability of the heart, and may be taken as a measure of the cardiac tolerance for work. When this stationary point has been reached, further immediate observation is unnecessary, subsequent management will depend largely on the degree of vital capacity reduction at this point. From an analysis of our series, we see that we may estimate the degree of limitation of activity for a given reduction from the normal vital capacity. The patient should then be placed on a regime consistent with his vital capacity reduction. We may carry our vital capacity studies still further and, by taking repeated reading at intervals, we may have an indication of whether our regime is within the limits of the patient's cardiac tolerance. If the vital capacity of the patient on a given regime decreases, we must assume, either that the regime is too strenuous for the patient, or that the patient is not abiding by the physician's orders. As in diabetes, having established the patient's carbohydrate tolerance, we continue examining for glycosuria to determine whether he is remaining within his tolerance, so in cardiac disease, we may use our vital capacity studies to indicate whether the cardiac tolerance has been overstepped.

That these impressions as to the practical value of vital capacity studies in dealing with heart disease, are true can only be definitely determined by a more complete study, which is being undertaken. However, there is little doubt that these applications will not only be confirmed by further study, but that an even wider usage will be established.

CONCLUSIONS

1. There is a definite reduction in the vital capacity of the lungs in cardiacs complaining of dyspnea.

2. The reduction in vital capacity seems to run parallel to the degree of impairment of heart function.

3. The most probable explanation of the reduced vital capacity is a loss of the normal lung elasticity, due to stasis in the pulmonary circulation.

4. Vital capacity studies have a definite practical value in diagnosis, prognosis and treatment of heart disease.

BIBLIOGRAPHY

1. Hutchinson, J.: On the capacity of the lungs and the respiratory movements. Med. Chir. Transactions, London vol. 29, 1846.
2. Peabody and Wentworth: Clinical studies on respiration. Arch. Int. Med., 1917, vol. 20, 443.
3. Lundsgaard and Van Slyke: Studies of lung volume. Jour. Exp. Med., 1918, vol. 27.
4. Dreyer, Georges: The vital capacity in man and its relation to size of the body. Lancet, Aug. 9, 1919.
5. West, Howard: Clinical studies on the respiration, comparison of various standards for vital capacity of the lungs.
6. Myers, J. A.: Studies on the respiratory organs in health and disease. Journal-Lancet, May 1, 1921, vol. 41.
7. Siebeck, R.: Uber die Bienflussing der Atemmechanic durch Krankhafte Zustande des Respirations und Kreislaufapparates. Deutsch. Arch. f. klin. Med. 1910, 100, 204.
8. Rubow, V.: Untersuching uber die Atmung bei Herzkrankheiten, Deutsch. Arch. f. klin. Med. 1908, vol. 92.
9. Dubois and Dubois: A formula to estimate the approximate surface if the heighth and weight are known. Arch. Int. Med. vol. 17, 1916.
10. v. Basch: Experimentelle Untersuchhungen aus den Laboratorium. v. Basch, 1891, 1892.
11. Adams and Sturgis: Note on the vital capacity of the lungs and the carbon dioxide combining capacity of the blood in cases of "Effort Syndrome". Am. Jour. Med. Sc., 1919, vol. 158, p. 816.

DISCUSSION

DR. M. H. NATHANSON, Minneapolis: It is rather striking that with all the complicated procedures in medicine at present, such a simple procedure as having an individual take as deep a breath as possible and then measuring the volume expired, has not been utilized in the study of disease. There are probably two reasons for this: first, because standards for the estimation of the normal vital capacity have not been established until recently, and secondly, because we have not understood the relation

of vital capacity changes to diseased conditions. Normal standards have now been fairly well worked out, and considerable work has recently been done on the study of changes in vital capacity in disease.

A very striking point brought out is the close relation ship between the reduction in vital capacity and the tendency to dyspnea in heart disease. Practically all cases that found it necessary to restrict their activities did so because of dyspnea, dyspnea occurring when they passed a certain point. One might expect that the reduction in vital capacity and tendency to dyspnea could be explained on the same basis, since the two seem to be so closely associated. It it strange that dyspnea has not been properly explained. We suspect a person with dyspnea of having heart disease but we do not know the exact mechanism by which it has been produced. Because of the frequent association of dyspnea with heart disease, we have concluded that shortness of breath is an evidence of impairment of cardiac function. However it would mean a good deal more to us if we could picture the mechanism of dyspnea production on the basis of an impaired heart function. This, I believe we can now do. There has been a prevailing idea that dyspnea is due to a disturbance in the gaseous exchange. This, however, does not occur in ordinary cases and if it did, it would not explain the ordinary discomfort and difficulty in breathing which we term cardiac dyspnea.

When the heart's functional capacity is reduced, in practically all cases there results first, a change in the pulmonary circulation. There is a stasis and increased pressure in the pulmonary circulation and the capillaries entwining the alveoli become overfilled. It has been pointed out that when this change occurs, there is a loss of elasticity in the alveoli. They cannot expand and contract as they normally should. In inspiration our thorax enlarges and our lungs expand correspondingly. If the elasticity of the alveoli is normal, there is no difficulty; but when this reduction in elasticity occurs, the muscles of respiration must work to a much greater degree in order to obtain the same amount of lung expansion. A patient tells us that he becomes short of breath on exertion. This individual is working his respiratory muscles to such a degree, in order to get the proper amount of air through his lungs, that he has discomfort or dyspnea. If this is the correct explanation of cardiac dyspnea, and it is the most plausible at present, it would also explain the association of the reduced vital capacity with cardiac dyspnea. It is evident then that the reduction in vital capacity might be an index of the reduction in alveolar elasticity. Since in heart disease this condition is apparently due to an impairment in heart function, it follows that the vital capacity might indirectly give a measure of heart function and these charts bring out this point.

DR. HAROLD L. RYPINS, Minneapolis: This last chart (Chart 6, D) of Dr. Ulrich's illustrates how closely the vital capacity follows the course of the disease. This first patient came in with a much reduced capacity but under rest it went up to 2600 and his clinical condition was very good. The second case (indicating) shows a man who also rested in bed. He came in with 1400 vital capacity and it did not go up, but stayed about the same for some time and went down shortly before death. His prognosis is very well shown by the fact that he did not respond to rest. The third case shows a man with about 1500, which goes down a little further on activity, but under rest goes up again. The response to the rest treatment was very good. The last case, with a vital capacity of approximately 1100, went up to 2200. He then went home and returned with his vital capacity at about 900. He was again put to bed and this time it went up to 2000, when he again discharged himself and came back after a time with a vital capacity under 1000, and this time under rest it went up to only 1800. You notice that each time under rest the vital capacity increase goes down a little. The last time he came in the vital capacity was down and under rest it went up to only 1500. He could not recover the full vital capacity or anything near it and died a cardiac death.

DR. J. A. MYERS, Minneapolis: It is evident that this splendid contribution by Drs. Ulrich and Nathanson has been carried out in a very thorough-going and scientific manner. Their data, therefore, being reliable, will be found of great value to others who desire to use them in a practical way or in further investigative procedures.

It is very gratifying that these investigators have found this test so valuable in diagnosis and prognosis and in studying clinical progress in cardiac disease, as has also been found by others in pulmonary disease.

DR. MOSES BARRON, Minneapolis: I think that the relation of the condition of the capillaries in the alveolar walls to the functional capacity of the lung as brought out in this paper, is very interesting. When the alveolar wall is thickened by the distended capillaries, as is the case in cardiac decompensation with passive congestion of the lungs, the elasticity of the lung parenchyma is reduced, and the process of respiration is altered. Those who remember the microscopic appearance of the lungs in chronic passive congestion, presenting the greatly engorged and tortuous capillaries, which distend the alveolar walls, can appreciate the embarrassment to respiration from the relative inelastic walls. It is obvious that with the more rigid alveolar walls, greater inspiratory effort is necessary to expand the lungs, and this results in dyspnea. Such a concept helps us to visualize the physical basis of dyspnea. It also helps us to explain the relation of vital capacity to dyspnea in heart disease; the diminution in the vital capacity being almost directly proportional to the intensity of the dyspnea.

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Vol. IV December, 1921 No. 12

EDITORIAL

BASIS FOR THE TUBERCULOSIS CAMPAIGN*

Speaking broadly the present campaign against tuberculosis starts out with the fundamental premises that infection against tuberculosis is practically universal; that this infection occurs for the most part in early childhood; that breakdown with tuberculosis in later life is due to the giving way of what we are wont to call "normal resistance," a term of very indefinite meaning. Building upon these premises, there are at the present time three fairly well defined schools of thought more or less opposed to each other as to the need for and the basis of a campaign against tuberculosis.

There is first of all the group of tuberculosis workers, comprising most of those who are at present affiliated with the campaign, who believe that breakdown with tuberculosis is caused by factors that may be found in the environment, personal hygiene and habits of the individual. Such factors as bad housing, bad living, bad working conditions, faulty personal habits of eating, sleeping, working, exercising, etc., are in a measure the ones that cause tuberculosis as distinguished from infection or tubercle.

There is a second group of thinkers of a much smaller proportion, most of whom are found in the eugenics school, who say that environmental causes and factors dealing with personal hygiene have relatively little to do with tuberculosis. The big fundamental cause is the racial factor. It does not matter what a man does, or how he works, or where he works. If he inherits the right kind of race stock, he will survive; if he does not, he will succumb to tuberculosis. Such men as Karl Pearson, Raymond Pearl and Charles Davenport would strongly defend this point of view.

A third group of thinkers headed by such men as Professor McCollum of Johns Hopkins University would minimize any apparent factors dealing with the infection and race factors and would lay the emphasis rather upon the nutrition factors. They would say that it is not so much a matter of environment nor is it a matter of race; it is what a man eats that determines his normal resistance and prevents his breakdown with diseases such as tuberculosis. This group would probably not be so extreme in their exclusion of other factors as the eugenics group, but they would lay the predominating emphasis upon nutrition.

The average worker in the campaign against tuberculosis, whether physician or layman, will use as a basis for his campaign, if he is wise, the distinctive ideas of these three schools. There is nothing conflicting between the three positions and a broad, comprehensive tuberculosis movement must recognize that breakdown with tuberculosis may well be a combination of environmental, racial and nutritional factors.

The campaign against tuberculosis in the United States is financed from the sale of Tuberculosis Christmas Seals. Sale of these Seals will be held in December this year. The earnest support of physicians in developing a broad program for the control of tuberculosis is desired.

*Prepared by the National Tuberculosis Committee.

A. M. A. OF VIENNA

The personnel of the teaching staff and the wealth of clinical material in Vienna has already begun to again attract the medical profession of America. Recently there were some twenty American physicians studying in Vienna, for the most part eye, ear, nose and throat specialists. The Viennese, strange to say, have not lost their cordiality although they have lost almost everything else as a result of the war, and returning physicians report a very kindly reception. So numerous are the visitors that there is considerable agitation towards the reestablishment of the American Medical Association of Vienna and resuscitating the Association property which was assigned to Dr. Lange who has returned to Chicago.

Professor Hayek now is in charge of the old Chiari Nose and Throat Clinic. Professor Neumann is assisted by Drs. Ruttin and Beck in the old Politzer Ear Clinic. English courses are given by these two assistants. Professor Dunnier has the old Fuchs Clinic and Professor Meller the former Dunnier Clinic, the latter being assisted by Dr. Boehstedt as first assistant and Dr. Fuchs as second assistant. Professor Akexander is at the Polyclinic and also is teaching Americans.

The foreign exchange is so ridiculously in favor of the American dollar that there is no doubt but that an American can live at a very fair Vienna pension on a dollar a day. In August a dollar bought 1150 kronen and at present about 1800. A street car ride is seven kronen or less than half a cent. The medical courses arranged as a rule by the department heads cost between 2000 and 3000 kronen an hour.

It is reported by a recent visitor that the first six months of 1919 were the very worst for Vienna since the war began. There was no food and no fuel. It was stated authentically that Hoover actually saved thirty per cent of the population of Vienna from starvation. Whereas, before the war, Austria had a population of thirty million, exclusive of Hungary, it now is reduced to six million, two million of whom reside in Vienna. There has been a rather general feeling in favor of the reinstatement of the former Emperor Carl, the deplorable condition of Austria today being the main reason given. Many believe the only salvation of Austria lies in a union with Germany.

A period of study in Vienna would surely be quite worth while, but the steamship rates should be thoroughly investigated beforehand.

TUBERCULOSIS IN MINNESOTA

Recently, at a conference of tuberculosis and other public health workers, the writer was requested to account for the reduction in the death rate from tuberculosis in Minnesota.

Along with other states, similarly active against the white plague, Minnesota has already reaped some of the benefits from its labors and now enjoys one of the lowest death rates from tuberculosis of any state in the registration area. A reduction of 17 per cent has been made since 1914. This reduction is for the state at large and includes areas not at all active in anti-tuberculosis work. Recently figures were compiled which showed a fall of 25 per cent in a district maintaining a sanatorium. In 1920 alone 426 deaths were prevented by reason of this reducted rate and had the 1914 death rate been experienced each year since that date 929 more deaths would have occurred than have been reported.

Von Behring contended that childhood infection confers immunity against subsequent contact with tuberculosis bacilli from outside sources, with lesions established in childood remaining latent over years, finally to reactivate upon the reduction of this acquired immunity with active disease developing in these lesions. The more recent views of Opie maintain that childhood infection, while conferring a protective immunity more or less relative, does not prevent fresh lesions from forming as a result of infections from outside sources during adult life, but does alter the type of resultant disease, producing the chronic pulmonary tuberculosis with fibrous tissue formation and tendency to healing which is distinct from the fulminating rapidly advancing type of the disease which develops among unprotected or non-vaccinated peoples coming in contact with the bacillus for the first time. We should in either case be inspired by the fact that because of an ever increasing edu-

cational campaign, a comprehensive, and, we anticipate, a growing institutional system, our people in increasing numbers, are being protected from the dangers of massive and repeated infections.

It is being demonstrated that the degree in which we care for our open cases of tuberculosis in quarters outside of the home reduces the supply of future consumptives.

Newsholme, in 1908, was able to show that should one-fifth of the total deaths from tuberculosis in a community occur in institutions, (in other words, outside of the home) following an average residence of one-third of a year, which is about one-ninth of the duration of the average fatal case, that the annual reduction of the death rate in that community should be about 2 per cent. Minnesota's experience would tend to prove this contention. With fourteen county sanatoria and one state sanitorium thousands of tuberculous individuals have been given opportunity for regaining lost health, a large majority of these being open cases whose residence in institutions has removed the source of tuberculous infection from numerous homes. Over 5,500 cases of tuberculosis had passed through our county sanatoria alone on January 1, 1921. Of these, 2,087 cases had tubercle bacilli at some time.

The knowledge that the fight against the white plague is being won here in Minnesota should greatly encourage all of us to renewed and still greater efforts. The activities of the many public health organizations, county and municipal, as well as state, have through their various projects stimulated wide spread interest in health matters and have placed in the hands of a great majority knowledge of health conditions, disease prevention and remedial measures required. R. B.

OBITUARY

GEORGE F. MERRITT

The long medical career of Dr. George F. Merritt, of St. Peter, was brought to its close on October 26, 1921. Born December 21, 1846, in Danvill, N. Y., the son of George and Harriet (Hicks Wright) Merritt, in 1856 he moved with his parents to Burlington, Iowa. Here he attended the public schools and graduated from Burlington College. He received his medical degree from Rush Medical College, Chicago, in 1872, and immediately began practice in St. Peter, where he practiced until his death. In 1876 Dr. Merritt married Miss Jenny Lambie, of Plainview. He served as city public health officer for many years and at one time was coroner of Nicollet County. Besides being a member of County and State Societies and the American Medical Association, he served as treasurer of the Minnesota Valley (now Southern Minnesota) Medical Association, and one year was its president.

Dr. Merritt is survived by Mrs. Merritt and four children, Mrs. Philip Dick, Louise, Laura and Robert Merritt.

Frank L. Bradley, M. D., St. Louis Park, Minn. Seventy-seven years of age; graduate of Rush Medical College 1868; died Oct. 12, 1921.

John Rundstrom, M. D., St. Peter, Minn., eighty-six years of age; died during October, 1921.

John Henry Stewart, M. D., St. Paul; born 1861; graduate of Cornell University and College of Physicians and Surgeons of New York City; died during October, 1921.

REPORTS AND ANNOUNCEMENTS OF SOCIETIES

SOUTHERN MINNESOTA MEDICAL ASSOCIATION

ANNUAL MEETING

Mankato, December 5th and 6th, 1921

OFFICERS

Dr. W. J. McCarthy, Madelia, President.

Dr. E. D. Keyes, Winona, 1st Vice President.

Dr. W. R. Ramsey, St. Paul, 2nd Vice President.

Dr. H. T. McGuigan, Red Wing, Secretary.

Dr. G. F. Merritt, St. Peter, Treasurer.

Dr. Aaron F. Schmitt, Minneapolis, Secretary-General.

Monday, 2 p. m., December 5th

Symposium: "Campaign in Southern Minnesota for the Prevention of Cancer"—Dr. H. W. Cook, Minneapolis; Dr. H. B. Zimmerman, St. Paul; Dr. C. H. Mayo, Rochester.

"Primary Carcinoma of the Lung"—Dr. R. I. Rizer, Minneapolis.

"A Discussion of the Changes Produced in the Blood Stream by the Rational Treatment of Infected Teeth and Their Investing Tissues"—Dr. T. B. Hartzell, Minneapolis.

"Factors in the Health of Older Children"—Dr. E. J. Huenekens, Minneapolis.

Monday, December 5th

ANNUAL BANQUET, MASONIC HALL, 6:30 P. M

Monday, 8 p. m.

Address of Welcome—Mayor W. A. Beach.

President's Address—Dr. W. J. McCarthy, Madelia.

"Industrial Medicine and Surgery" (L)—Dr. W. O. Sherman, Pittsburgh.

"Causes of Failure of Operation for Chronic Appendicitis"—Dr. C. J. Rowan, Iowa City.

"Treatment of Duodenal and Gastric Ulcer"—Dr. A. C. Strachauer, Minneapolis.

"Surgical Aspects of Neurological Surgery" (L)—Dr. A. W. Adson, Rochester.

Tuesday, 8 a. m., December 6th

"Chronic Non-Tuberculous Lung Infection"—Dr. H. M. Conner, Rochester.

"Resume of Recent Progress in Urology"—Dr. W. F. Braasch, Rochester.

"Premenopaustic Uterine Prolapse"—Dr. E. Z. Wanous, Minneapolis.

"Diagnosis and Treatment of Osteomyelitis"—Dr. C C. Allen, Austin.

"The Dental Examination" (L)—Dr. B. S. Gardner, Rochester.

"Chloroform Asthesia"—Dr. P. F. Holm, Wells.

"Pyelitin"—Dr. A. E. Sohmer, Mankato.

Luncheon—12:00 to 1:00 p. m., Tuesday

This luncheon is tendered by the Physicians and their Ladies of Mankato.

Tuesday, 2 p. m., December 6th

"Psycho-Analysis"—Dr. C. R. Ball, St. Paul.

Symposium: a. "A Resume of Partial Rectal Prolapse with a Suggestion as to Treatment" (L) D. W. A. Fansler, Minneapolis.

b. "The Technique of Removal of High Rectal and Sigmoid Polyps" (L)—Dr. L. A. Buie, Rochester.

"Surgery in Perforated Typhoid Ulcer" (L)—Dr. F. C. Schuldt, St. Paul.

"Recognition of the Sphenopalatine Ganglion"—Dr. R. A. Barlow, Rochester.

"The Treatment of Empyema"—Dr, A. C. Baker, Fergus Falls.

"Thyroid Therapy"—Dr. R. G. Allison, Minneapolis.

"Complications following Surgery of the Gall Bladder and Bile Ducts"—Dr. W. C. Carroll, St. Paul.

"Retroperitoneal Lipomata" (L)—Dr. J. C. Masson, Rochester.

A Minnesota branch of the Society for Experimental Biology and Medicine (New York) has been organized and held its first meeting at the Men's Union, University of Minnesota, on October 12, 1921.

The meeting was preceded by an informal supper. Dr. Arthur D. Hirschfelder was elected Executive Secretary, and Doctors F. H. Scott, E. C. Kendall, E. J. Lund and L. S. Palmer were elected members of the Advisory Committee.

Dr. E. B. Meigs of the United States Department of Agriculture gave a brief address on "Amino Nitrogen of the Blood in its Relation to Diet and Milk Secretion." The following papers were then presented:

E. J. Lund—A Micro-Winkler Method for the Determination of Dissolved Oxygen.

R. Green (by invitation)—An Apparatus for the Direct Determination of Surface Tension.

W. P. Larson—Effect of the Surface Tension of the Culture Medium upon the Growth of Bacteria.

J. F. McClendon and H. Bauguess (by invitation)—Experimental Rickets.

A. D. Hirschfelder and L. J. Pankow (by invitation)—Does the Introduction of an Ethoxy Group into Aromatic Compounds Increase their Bactericidal Action upon the Pneumococcus and the Gonococcus?

There is only one other branch of the Society for Experimental Biology and Medicine besides this branch at Minnesota.

The twentieth semi-annual meeting of the Blue Earth Valley Medical Society was held at Blue Earth, Minnesota, Thursday, October 27th. Papers were presented by the following physicians: Drs. S. Erickson, H. B. Bailey, A. F. Hunt, F. W. Logan, S. Hermann, W. J. Richardson and G. H. Luedtke.

At the recent annual meeting of the St. Louis County Medical Society the following officers were elected: Dr. C. L. Haney, president; Dr. O. W. Parker, vice president; Dr. L. A. Barney, second vice president; Dr. F. H. Magney, secretary and treasurer; Dr. W. A. Coventry, delegate; Dr. A. H. Collins, alternate delegate; Drs. S. H. Boyer, J. J. Eklund and E. L. Creney, board of censors. All elected members, with the exception of Dr. Barney, who is from Ely, are residents of Duluth.

At the annual meeting of the Lyon-Lincoln Medical Society, held at Tracy October 11th, the following officers were elected: Dr. W. G. Workman, Tracy; president; Dr. G. L. Jacquoat, Tyler, vice president; Dr. H. M. Workman, Tracy, secretary-treasurer; Dr. L. Vadheim, Tyler, delegate; Dr. O. L. Bossingham, Lake Benton, censor for three years.

OF GENERAL INTEREST

Dr. R. Gilmore, of Bemidji, has returned from a trip to Chicago.

Dr. E. P. Hawkins and family, of Montrose, have gone to Florida for the winter.

Dr. Mary McCoy, of Duluth, announces the opening of offices at 404-406 New Jersey Building.

Dr. E. L. Kannary, of St. Paul, has returned from a hunting trip spent in the northern part of the state.

Dr. C. R. Sanborn, of Bemidji, has been in Chicago where he attended the Soo Surgical Association convention.

Dr. C. V. Lynde, who has been practising medicine at Waubun, Minnesota, has recently located in New London.

Dr. Harry T. Frost, of Crookston, has located in Hallock, where he will engage in the practice of medicine and surgery.

Dr. Wm. Meierding, of Springfield, has received his reappointment as Examiner for the U. S. Public Health Service for that district.

Dr. George A. Geist, of St. Paul, attended the Clinical Congress of the American College of Surgeons held in Philadelphia during October.

Dr. Howard Weirick, of Hibbing, has been appointed a member of the State Board of Health. Dr. Weirick will succeed the late F. W. Cappelen.

Dr. Arthur T. Caine, for many years a practicing physician at Anoka, has been appointed superintendent of the Anoka State Hospital for the Insane.

Dr. W. T. Anderson has recently moved to St. Paul and is associated with Dr. Lerche. He is a Johns Hopkins graduate and served in the medical service during the war.

Dr. Waltman Walters, of Rochester, recently delivered an address before the American Association of Physicians and Surgeons at their annual meeting held in Chicago.

Dr. F. C. Mann, of the Mayo Clinic, Rochester, gave a very interesting lecture in the Clinic Lobby on the evening of October 21st on the subject of Experimental Research.

Dr. Cyrus Northrop, ex-president of the University of Minnesota, delivered a Mayo Foundation lecture on general education, Tuesday, October 11, in the lobby of the Mayo Clinic.

Dr. S. B. Haessley, of Faribault, left the last week in October for Great Falls, Montana, where he joined a hunting party which started for the Rocky Mountains in search of big game.

Dr. P. C. Davison and Dr. B. J. Branton, of Willmar, were given fellowships in the American College of Surgeons. They received these honors publicly at Philadelphia, October 28th.

Dr. A. W. Adson, of the Mayo Clinic, Rochester, recently read a paper before a medical meeting at Lewiston, Idaho, following which he presented a paper before another medical gathering in Philadelphia.

Dr. A. F. Schmitt, of Mankato, has moved to Minneapolis and has opened offices at 705-707 Physicians and Surgeons Building. Dr. Schmitt will still retain the office of secretary general of the Southern Minnesota Medical Association.

Dr. E. W. Benham, of the Mankato Clinic, Mankato, accompanied by his family, left on an extended automobile trip which will include many of the large eastern cities. They will then motor to Florida where they will spend the winter.

The Board of Regents of the University of Minnesota has granted a three months leave of absence to Dr. J. P. Sedgwick, head of the department of pediatrics. The Board has also granted a year's leave of absence to Miss Louise M. Powell, superintendent of the school of nursing.

Dr. Lillian L. Nye formerly instructor in the Chemistry department of the University of Minnesota, has taken her M. D. degree from Johns Hopkins and has later completed a year in Pediatrics. She has come to St. Paul and will be asociated with Dr. Katherine Nye and Dr. Jennette McLaren at 803 Lowry Bldg.

Sir Harold Stiles, of Edinburgh, Scotland, presented a paper, "Brachial plexus neuritis caused by pressure of the first rib," before the meeting of the general staff of the Mayo Clinic, Wednesday, October 12. He also delivered a Mayo Foundation lecture, "The history of medicine in Edinburgh," Friday, October 14.

Dr. C. Eugene Riggs, President of the Minnesota State Medical Association, gave a Mayo Foundation lecture Tuesday, October 4 in the Assembly Room. Dr. Riggs repeated his presidential address, "Minnesota Medicine in the making; personal reminiscences," which he gave at the meeting of the Minnesota State Medical Association in Duluth, August 24.

The Wright County Medical Society recently held its annual meeting at Buffalo, Minn., at which the following officers were elected for the ensuing year: Dr. E. E. Shrader, Watertown president; Dr. A. G. Moffatt, Howard Lake, vice president; Dr. John J. Catlin, Buffalo, secretary; Dr. C. L. Roholt, Waverly, delegate, and Dr. E. E. Shrader, Watertown, alternate.

The Children's Club has recently been opened at 1633 Portland Avenue, St. Paul, under the supervision of Mrs. R. L. Barry. The Club is designed to meet the needs of busy mothers who, during social engagements, desire assistance with their their children; and of parents who wish to be absent from home for the evening or longer, or who, through illness, find it convenient to have their children cared for temporarily. The Club is endorsed by several leading physicians and business men of prominence. A trained nurse experienced in the care of children will be in constant attendance.

The merger of the Schools of Nursing of the Minneapolis General Hospital, the Charles T. Miller Hospital of St. Paul, and probably the Northern Pacific

Hospital, with the School of Nursing of the University of Minnesota enables the University to offer a greatly increased registration with the greatly enlarged capacity for teaching, and also a more complete training of the nurse in public and private nursing and in all forms of disease, accident and emergency. Miss Louise M. Powell, Superintendent of the School of Nursing at the University, would be glad to receive the names of any prospective students of nursing. The students in nursing share the privileges and opportunities of all women matriculants in the University. The University offers the following courses: (a) A three years' Course in Nursing. (b) A five years' combined Course in the College of Science, Literature and the Arts and in the School of Nursing. (c) A Course in Public Health Nursing for Senior and Graduate Nurses.

Public Health Nursing—The second course in Public Health Nursing for 1921-22 will open on January 4, 1922. Lecture courses are given by University teachers in the Medical School and the Department of Sociology and by representatives of the State Board of Health. Practical work is conducted in cooperation with the Hennepin County model practice field, the Visiting Nurse Association, the Infant Welfare Society, the Public School Department of Hygiene, the industrial service of private corporations, the County Tuberculosis Sanitoria, and the Medical Social Service Department of the University Dispensary.

A tuition fee of $25.00 and contingent fees amounting to $7.00 cover the course in each four months' period. Applications should be made to Miss Louise M. Powell, Superintendent, School of Nursing, University of Minnesota.

MISCELLANEOUS

Mankato, Minn.,
Oct. 31, 1921.

The medical profession is confronted with a problem that must lead to honor or dishonor as a sequel to the recent ruling of A. W. Mellon, Secretary of the U. S. Treasury. By this ruling a physician may prescribe two and one-half gallons of beer or two quarts of wine as a medicine and there is no limit as to how frequently he may give this prescription to the same patient. The ruling further provides that these beverages shall be sold by the druggist, delegating to him the right to determine whether or not the patient who holds a prescription for either one or both of these beverages is in need of the same for medical purposes. This is a veritable paradox.

By this ruling the druggist is made the bar tender and the physician the servant of the inebriate, the wine bibber and the beer drinker;

Therefore, resolved first, by the Blue Earth County Medical Society in regular session assembled that the medical profession does not recognize wine and beer as a medicine; but, if in particular cases it be so recognized by some physicians, the present power delegated to physicians to prescribe for medicinal purposes, not to exceed a pint of liquor in ten days to any one person, is surely sufficient in the interests of the sick.

Second: that we recognize in beer a certain amount of nutrition which exists in the malt and the sugar but not in the alcoholic content. That we regret and deprecate the late ruling of the U. S. Treasury department which will operate as a flagrant technical violation of a portion of the constitution of the U. S. and create a greater disrespect for law and order.

Third: Resolved that we express the hope that the medical profession in general and the members of Blue Earth County Medical Society in particular will ignore the ruling of the secretary of the treasury and refuse, to the everlasting honor and credit of the profession, to use the powers thus delegated to the members of our profession by the aforesaid ruling.

Fourth: Resolved that a copy of these resolutions be spread upon the minutes; that a copy be sent to each of our Minnesota State Medical Journals, and to each of the following: President of the U. S., Secretary of the Treasury, Senator Knute Nelson, Senator Frank Kellogg, and Representative Frank Clague; that a copy be given to the Mankato Free Press for publication.

These resolutions were unanimously adopted by the Blue Earth County Medical Society, Mankato, Minn., Oct. 31, 1921.

EDITORIAL NOTE: This ruling does not affect physicians in Minnesota as our state is one of several which has a special law prohibiting the prescribing of beer by physicians.

PROCEEDINGS OF THE MINNESOTA ACADEMY OF MEDICINE

September 1921 Meeting

Dr. W. A. Dennis, presiding.

The Annual Meeting of the Academy was held at the Town and Country Club on Wednesday evening, Sept. 14th, 1921.

Reports for the year were read and the following officers were elected for the ensuing year:

President—Dr. H. L. Staples, Minneapolis.

Vice President—Dr. C. N. McCloud, Saint Paul.

Secretary-Treasurer—Dr. H. P. Ritchie, Saint Paul.

Dr. J. G. Cross retires from the Executive Committee, which is now composed of Dr. W. A. Dennis, Dr. H. B. Sweetser and Dr. J. T. Christison.

Dr. Oscar Owre showed 2 x-ray films of a case of kidney stone wherein the diagnosis was made positive by a pyelogram.

Dr. H. P. Richie gave the following case report:

Mr. Wm. W., age 50.

1. Complaint:—Painless hematuria.

2. History::—In 1917, while at a ball game had feeling of urgency but held off until compelled, when he passed many clots. This lasted for 48 hours. Was cystoscoped in Chicago, with negative findings. He passed blood for about three days afterward when it stopped. Up to August 1921, had had no trouble and so far as he knows passed no blood. In August noticed blood, not much in morning specimen but during the day this would increase until it seemed almost pure blood and he began to feel weak. Frequency and urgency since bleeding began.

3. Examination:—On August 24, 1921, was cystoscoped by Dr. Gilbert Thomas, to find gross blood in urine. Several small papillomatous growths in bladder. Hanging from left utreter was a small papilloma which receded from view at times. Right kidney o. k.

4. Pre-operative Diagnosis:—Papilloma of pelvis of left kidney with transplants along left ureter and in bladder.

5. Treatment:—Operation. Through 2 incisions removed kidney and ureter intact on August 29, 1921.

6. Specimen:—Shows massive papilloma of kidney pelvis and ureteral grafts.

7. Comments:—This tumor is named in the literature as papillary carcinoma, epithelioma and papilloma. Sixty-four cases have been recently reported from the literature by J. J. May. Diagnosis before operation is rarely made because there is no enlargement of the kidney sufficient to make it palpable and there are no signs usually present except the hermaturia. In this case the demonstration of a papilloma peeking through the ureter made the preoperative diagnosis exact.

The operation is somewhat difficult but without reaction as all work can be done extraperitoneally. Two incisions: first the usual one for nephrectomy, and second, the one for ureteral stone. This latter may be made through the rectus or McBurney incision; the latter one I distinctly favor.

8. Result: The patient made an uninterrupted recovery and is prepared for follow-up treatment of fulguration of the bladder grafts.

It is interesting to note the massive tumor and the history of 4 years of no complaint or disability in his active work as switchman.

The specimen of kidney and ureter was shown.

The address of the retiring president, Dr. Warren A. Dennis, was read, the subject being "Compulsory Health Insurance."

The meeting adjourned.

PROCEEDINGS OF THE MINNESOTA ACADEMY OF MEDICINE

Meeting of October 12, 1921, at the Town and Country Club.

Dr. H. L. Staples, presiding.

Dr. A. C. Strachauer, Minneapolis, reported two cases.

Case I. Carl L., age 50 years.

Complaint:—epigastric pain, nausea and vomiting.

History:—In 1916 patient began to have seasonal burning, epigastric pain occurring 1 to 2 hours after meals, and which also awakened him at night. Relief was obtained by food and soda and by vomiting. There were frequent remissions but symptoms gradually increased in severity, until last summer (1921) when pain became constant. Patient has recently restricted himself to liquids because of distress attending coarser foods. No history of blood in vomitus or stool. No history of jaundice.

Examination:—Physical examination is negative except for loss of subcutaneous fat and evidence of recent loss of weight.

Laboratory findings: Gastric analysis—amount recovered 700 c. c. total HCl 63 c. c., free HCl 43 c. c. Blood and urine normal. Wassermann negative.

X-ray:—Obstructing ulcer at pylorous with retention.

Clinical diagnosis:—Chronic ulcer of duodenum.

Treatment:—Upper paramedian incision, calloused ulcer at pylorus exposed. Excision of the ulcer and modified Finney pyloroplasty. Gall-bladder and appendix negative.

Pathologist's report:—Indurated, thickened ulcer 1.5 cm. in diameter. Section shows mucosa replaced by fibrous tissue with extensive inflammatory reaction.

Subsquent history:—seventh day postoperative, temperature 98, pulse 70; normal, uneventful convalescence

Comment:—Gastroenterostomy still continues to be the mainstay in the surgical treatment of gastric and duodenal ulcer. The operation is, however, unanatomical and unphysiological. While the majority of cases treated by gastroenterostomy obtain symptomatic relief, most of the chronic calloused indurated ulcers do not heal. This is also true of the similar type of ulcer treated medically, as verified by operation. The eradication of the ulcer is always a great satisfaction and should always be performed whenever possible, either alone or in conjunction with gastroenterostomy or pyloroplasty. The definite percentage of malignant degeneration of gastric ulcers is an additional reason for the resection of the latter lesion. The pyloroplastics with excision of the ulcer which I have performed have been one hundred per cent satisfactory.

Case II, John F., age 66 years.

Complaint:—Pain in epigastrium.

History:—In 1913, after a short prodrome of "dyspepsia" the patient began having burning epigastric pain two hours after meals, which was relieved by the taking of food or soda or by vomiting. A few weeks after the onset the patient had a frank hematemesis, and for a following period vomited "coffee ground" material. From 1913 to September 1921, patient had continually epigastric pain following meals, with relief by the taking of food, or vomiting. In September 1921 patient had a second large emesis

of old blood and following this was placed under diadetic management with no improvement.

Examination:—Elderly, well-developed, poorly nourished man. Negative except for enlarged prostate.

Laboratory findings:—Gastric content 300 c.c., total HCl 27 c.c., free HCl 10 c.c. Stool positive guaiac. Blood and urine negative. Wassermann negative.

X-ray:—Annular construction of pyloris and of stomach representing a large indurated ulcer or an early carcinoma.

Clinical diagnosis:—1, gastric ulcer; 2, gastric ulcer with carcinomatous degeneration.

Treatment:—Partial gastric resection, anterior Polya through right paramedian incision. Prepyloric mass adherent to pancreas was exposed. Moderate grade of gastric adenopathy present.

Pathologist's report:—Old chronic, indurated ulcer of stomach showing considerable connective tissue scar deposit and carcinomatous degeneration. Gastric lymph nodes show metastatic carcinoma.

Subsequent history—Seventh day postoperative, temperature 98.6, pulse 70; normal, uneventful convalescence.

Comment: The 8-year history of hematemesis, vomiting of "coffee-ground" material, epigastric pain two hours after meals relieved by the taking of food, alkalies, or by vomiting, is the history of a chronic ulcer. The miscroscopic examination definitely proved the lesion to be carcinomatous at the time of operation. This malignant lesion has surely not existed for eight years or more, and the conclusion that a simple, chronic gastric ulcer with malignant degeneration is well founded. The presence of free acid is to be noted in the gastric analysis. Of an hundred gastric and duodenal lesions at the University Hospital in the year 1920, twenty per cent of the carcinomas showed free acid to be present, some having actual hyperacidity; and twenty-eight per cent of the ulcers were attended by hypoacidity or anacidity. The Polya type of gastric resection is an eminently satisfactory surgical procedure. The functional results are much more satisfactory than after gastroenterostomy, and the operation should be more frequently performed for the eradication of pyloric ulcers as well as for the treatment of malignant lesions. My oldest living case was performed eight years ago last February.

Discussed by Dr. Head: The second case reported by Dr. Strachauer is one of extreme interest. In a number of hundred cases of gastric and duodenal ulcer which I have observed during the past 25 years this is the first case of carcinoma superimposed upon ulcer which has come under my notice in which a history of vomiting of blood preceded by more than two years the development of the carcinoma. It would seem that the evidence was clear in this case that the carcinoma developed on an ulcer base because the hemorrhage had preceded by so long a period the carcinoma.

There is, however, one possible explanation which ought to be considered and that is the possibility of the hematemesis having originated out of an ulcer which had later healed up and that the carcinoma had developed in some other part of the stomach. Of course the pathologist could not determine this point at such a late date unless the scar of a healed ulcer were found in the gastric wall.

I am greatly interested in this phase of the subject. It is clearly admitted by pathological studies, and has been for many years, that about 10 per cent of the cases of carcinoma are developed on an ulcer base. I do not think that the evidence is clear that 10 per cent are pathologically so implanted, but that is the general concensus of opinion. When we get beyond the 10 per cent figure, however, the burden of proof rests with those men, mainly, surgeons, who try to maintain that any larger percentage than that originate out of an ulcer base. With the accumulation of additional evidence we are slowly swinging back to the 10 per cent figure. I have never seen a case of cancer of the stomach in which the history of hematemesis preceded by more than from one to two years the fullblown evidence of cancer. This well-accepted fact and the short history of gastric complaint in patients with gastric cancer makes the cancer superimposed upon ulcer theory untenable in a large percentage of cases.

Dr. L. E. Daugherty, St. Paul, presented two cases for Dr. MacLaren.

Case I. Mrs. M. E. W., patient of Dr. Thos. Trutna of Silver Lake, first seen in 1913. Operated on for acute cystic gall bladder and made an uneventful recovery. Next seen in August 1921. Age 50. Mother of 6 children. Complains of a sense of "falling of the womb", constant pressure on the bladder especially at night. Pelvic examination showed a retroverted, large nodular, hard, fixed uterine tumor adherent to the uterine wall.

Operation was performed August 30th, 1921. Suprapubic hysterectomy, removed a large uterus with hard, calcareous subperitoneal fibroid, size of a goose egg, attached to the posterior wall, fixed in the pelvis. Specimen sent to Dr. Warwick at the Miller Hospital who reported a calcified leiomyoma. The following report was submitted by Dr. Warwick:

"Uterus about normal in size but on the posterior surface is a tumor about the size of a small orange. This is very firm in consistency and upon gross section is found to consist of a calcareous mass covered by a thin layer of muscle tissue. It is very nodular in appearance and is obviously a uterine fibroid which has consisted of whorls or firm white tissue which has later become calcified. Microscopic section of the uterine wall of the mucosa shows nothing of interest."

Thos. S. Cullen in "Adenomyomia of the Uterus"

published by Sanders in 1908 makes no mention of calcareous degeneration with reference to uterine tumors. In Cullen's earlier book on carcinoma of the uterus he mentions one somewhat similar case: "Uterine Calculi Associated with Adeno-carcinoma of the Body of the Uterus." He said:

"Our attention was first directed to this subject by a study of Cyn.-Path. No. 161. In this case, during removal of carcinomatous tissue from the uterine cavity a calculus was brought away. On referring to Fig. 217 (p. 412) this is seen in a form of a hollow hemisphere presenting externally a rough irregular surface. Chemically the calculus was composed of a calcium carbonate and calcium phosphate. I advised the hypothesis that there had existed a partially calcified myoma, which, during the breaking of the carcinoma had also shared in the degenerative process, so that merely the shell of the calcareous material had been left. A subsequent reference to the literture brought to light a similar case reported by Thorn who has made a statistical study of uterine calculi from the time of Hippocrates down. Thorn's patient was 55 years of age. Six years after the menopause she began to complain of uterine hemorrhages. Six months later she experienced labor-like pains which were soon followed by a profuse yellowish, bloody discharge. The uterus was the size of a three months' pregnancy. After dilatation of the cervix a calculus nearly the size of a man's fist was removed. It was characterized by a corallike formation, and contained in the clefts a network of fibres. The discharge ceased, but the hemorrhages returned in two months, and from the examination scrapings carcinoma was diagnosed. On histological examination the stone was found to resemble a calcified myoma; indeed, Thorn was of the opinion that it was nothing more than a myoma that had become calcified."

Case II. Mrs. C. E. H., Luverne, first seen Feb. 22nd, 1899. Patient 33 years old; married 7 years; one child 6 years old. When she was carrying this child she nearly miscarried twice; was put to bed and was quieted with opiates and was able to carry through. She gives a history of constant pelvic distress for the past two years; worse just before menstruation; better after the flow starts. Intercourse very painful of late. Examination showed uterus enlarged and tender, pushed to the left by tumor which was supposed to be a tube-ovarian cyst.

Operation at St. Luke's Hospital Oct. 14th, 1899. Two uterine fibroids, one the size of a small orange, and one slightly smaller, each with a thick calcareous shell like the shell of a goose egg, were removed by myomoctomy and the wounds closed with continuous catgut sutures. One year later, Dec. 25, 1900, she reports that she was better than she had been for years.

November 29th, 1901, the old pelvic distress has returned; the uterus was enlarged to the third month of pregnancy; uterus very tender. June 8th, 1902, laparotomy. Enlarged uterus covered by adherent omentum. Calcereous fibroids almost the same as the tumors removed at the pervious operation. Supravaginal hysterectomy; recovered; phlebitis of the left leg. July 10th, 1904, first had severe pain in the right breast, with tumor, so she says, the size of hickory nut; pain has continued off and on ever since. Tumor now the size of a goose egg, not adherent to the skin; glands were infiltrated clear to the apex of the axilla. October 21st, 1904, Halstead's radical removal of the breast; both pectorals and axillary contents. Died of general carcinomatosis in July 1905.

Discussion by Dr. Dunsmoor, Minneapolis. I recall a case which Dr. Abbott saw with me in the late 80s. Patient had a fibroid uterus. We put a large negative plate over the abdomen and inserted needles from positive electrode through Douglas cul de sac into fibroid. Ten years after that I operated on this patient and each place where the needle was inserted had calcareous degeneration, masses from the size of little finger to that of thumb.

Dr. E. M. Hammes, St. Paul, presented the following case.

Patient, male, 23 years of age; was under our care three years ago suffering from a dementia precox from which he made an apparent recovery. In February 1921 he was again admitted to Mounds Park Sanitarium, with a picture of confusion, acute excitement, restlessness and delusional ideas. His mental condition varied—better at times and at other times the same. About August 1st he had an attack of vomiting and abdominal distress lasting 24 hours, which he said was due to eating some cigar stubs, with which subsided after a course of calomel. On August 14th he had a similar attack accompained with considerable pain lasting 24 hours, without any temperature. On August 19th at 8 a. m. he complained of considerable abdominal pain and general tenderness; no temperature, no vomiting, no diarrhea. By noon the tenderness had markedly increased; the abdomen was rigid. At 5 p. m. his symptoms had increased; he had a temperature of 101 and a leucocytosis of 16,000. I asked Dr. George Earl to see him and Dr. Earl operated on him and found the following condition:

A belt buckle in his stomach; a teaspoon, many hairpins, sticks of wood, pieces of metal and other paraphernalia in the upper portion of the duodenum; in the large bowel one could feel many small stones, one fairly large bolt and other foreign objects. Dr. Earl removed the belt buckle from the stomach by an incision in the stomach and the foreign bodies from the duodenum by an incision in the deodenum. The patient rallied from the operation and the next morning he told me he had swallowed the teaspoon prior to his entrance to the hospital in February 1921. He did not remember when he swallowed the

belt buckle, but he said he had been swallowing substances off and on since his stay at the hospital. Along with this condition the patient had an acute inflammatory appendix which Dr. Earl removed. The patient died 48 hours later. No post-mortem was permitted.

Articles taken from patient were shown.

Dr. George Earl, St. Paul. The leucocyte count for the two preceding days had been rapidly increasing so we decided to operate, after making a diagnosis of foreign bodies. Marked tenderness over region of appendix and other point of tenderness over duodenum. Made a generous incision, felt a mass in abdomen, also the buckle in the stomach. The spoon was projecting through the pyloric opening but was unable to move it. The mass was implanted in the duodemum and we did our best to force it back into the stomach. In the region of the duodenum there was quite an exudate and we hesitated whether to do a gastroenterostomy and remove the foreign substances. Mental patients are the poorest risks. Even boils and abscesses that other patients stand very well cause death in mental cases. They often die from the slightest infection. We reflected the duodenum back and removed the mass. The appendix was also acutely inflamed, large swollen and edmatous. We hesitated to remove that but felt that we might be taking a chance and so removed it.

Dr. Herbert Jones, Minneapolis, showed a specimen of carcinoma of esophagus. Patient operated on by Dr. Lerche.

This man came to me about three years ago. Had a history running back for at least one year before that of gradually increasing difficulty in swallowing. We soon found that he had a stricture of the esophagus and sent him to Dr. Lerche. He looked at the esophagus and the important thing was that he could not get the esophagoscope down far enough to get into the stricture. There was absolutely no raw surface. He tried several times to get a piece off the esophagus for diagnosis. Finally concluded that it was not carcinoma.

Specimen shown. The stricture is well above the ulceration. The tumor had evidently grown underneath the mucous membrane and caused the stricture. The fact that he had a history running along practically 4 years ruled out carcinoma for him. The man went along with that condition of gradual emaciation but working up to within a few months of death.

This goes very well with these other cases reported this evening. Apparently this carcinoma had a history of 4 years' duration, so that I think the time of a good many of these carcinoma cases will have to be lengthened out and not limited to one or two years.

Dr. A. E. Benjamin, Minneapolis, reported two cases of octopic pregnancy.

Case I. Mrs. G. M., age 32, housewife, American. Anemic. Past History: Healthy as a rule. Influenza and pneumonia two years ago.

Constipation moderate. Occasionally nausea and pyrosis. Menses: began at 13 years, regular and normal. Marital: 11 years. 1 child 10 years—normal pregnancy, labor and puerperium.

H. H. July 5, 1921, began having bloody discharge and bearing down pains. More or less continuous ever since. Noticed lump in lower abdomen at same time. Pains have become more severe and tend to come in spells.

Has been able to make bowels move only with greatest effort for past month.

Examination: Semi-cystic mass reaching to umbilicus, not tender, smooth surface. Cervix pushed tight against symphysis by a large mass filling the pelvis and flattening the rectum to the point of entirely obliterating its cavity. Mass quite tender, fluctuation (?) yet firm; no distinct hard nodules except anteriorly above the cervix—uterus (?).

Hemorrhagic spot in naval.

Leucos: 16,000. Hb. 53 per cent. Clotting time 4 min. Bleeding time 6 min. R. B. C. 3,500,000. Blood pressure 124/86. Diagnosis: Cyst of ovary. Myoma of uterus and octopic.

Operation: 9/22/21. Gas and ether. N. W. Hosp. Midline incision. Large fibroid uterus—pregnancy of left tube ruptured. Fetus 2½ months. Movements noticeable. Left ovary slightly cystic. Supravaginal hysterectomy and removal of left tube. Rubber tube drain into cul de sac.

Convalescence: So far uneventful. Has had some abdominal pain. Somewhat distended. Slight rise of temperature in p. m. but has made a very good recovery.

Case II. Mrs. C. 33 years, clerk, American. Anemic.

Past History: Negative. Constipation, moderate.

Menstrual: Began at 14, regular 28 day type, duration 5-6 days, normal flow, no pain. An abortion at 2 months 5 years ago. Last period June 28, 1921, normal. When flow did not appear in July took hot douche and hot bath with resulting serosanguinous discharge. Continued 6 weeks. Severe pain in abdomen with weakness, fainting feeling, Aug. 29.

Examination: Sept. 9, 1921. Dulness in lower abdomen and semi-fluctuating mass in pelvis.

Hgb. 35. Loucocytos 11,000.

Diagnosis: Ectopic pregnancy.

Operation: St. B. 9/12/21. Gas and ether. Low median incision. Left tube bulging at fimbriated end. Abdominal cavity filled with old blood. Left tube and blood removed. Rubber tube drain. Hypodermoclysis on table.

Convalescence: Slow but uneventful. Citrate of iron by hypodermic for anemia. Temperature ranging from 99-101 for first week and gradually declining to normal.

Dr. R. E. Farr, Minneapolis, reported following case:

Name: F. M., age 21, single, student.

Entered hospital September 25, 1921.

Present Complaint: Injury to left hip.

History: While playing football patient was tackled and thrown, striking on his left hip. Was unable to move the limb, and has had considerable pain since the injury which occurred Sept. 25th, 1921.

General Examination: Negative.

Examination of left lower limb: Left foot is rotated inward, lying across the instep of the right foot, with the left knee lying against the right knee. Limb partially flexed. Muscles extremely tense. Greater trochanter above Nelaton's line.

Diagnosis: Dislocation of femoral neck, post glenoid. Radiogram confirms diagnosis.

Operation: Reduction under local anesthesia. No preliminary hypodermics. Six ounce infiltration block following the direction of the femoral neck with a five-inch needle. Before three ounces were injected the large muscles were completely relaxed. Slight movement of the femur was painless, and the limb was perfectly comfortable, whereas he had been suffering considerable pain before the injection was made. Three ounces more were used with the result that the boy could be lifted from the stretcher and laid on the floor without producing pain. Five minutes after the injection was finished the dislocation was reduced by manipulation. Two assistants held the pelvis in contact with the floor while I made the manipulations, assistance being necessary in order to lift the head over the rim of the acetabulum. The fifth attempt was successful. The radiograms show the condition before and after, and the photographs were all taken at the time of the operation. We had as perfect anesthesia as though the patient had been asleep and the relaxation was equally as good.

Dr. Gilfillan: What anesthetic, and of what strength, do you use?

Dr. Farr: 0.7 of 1 per cent procain.

Dr. Harry B. Zimmerman of St. Paul, read a Thesis on "Acute Intestinal Ilous."

NOTE: Discussion of Dr. Zimmerman's paper will be published with the paper in a later issue of Minnesota Medicine.

NEW AND NON-OFFICIAL REMEDIES

During October the following articles have been accepted by the Council on Pharmacy and Chemistry for inclusion in New and Nonofficial Remedies:

Davis and Geck:

Kalmerid Germicidal Tablets, Potassium-Mercuric-Iodide.

Eastman Kodak Company:

Eastman Barium Sulphate for Roentgenology.

Powers-Weightman-Rosengarten Co.:

Copper Citrate—P. W. R.

Mercury Benzoate—P. W. R.

Mercury Cyanide—P. W. R.

Mercury Succinimide—P. W. R.

Silver Citrate—P. W. R.

Silver Lactate—P. W. R.

Solution Arsphenamine—Lowy: This product has been acquired by E. R. Squibb and Sons, and is retained in New and Nonofficial Remedies as Solution Arsphenamine-Squibb.

NEW AND NONOFFICIAL REMEDIES

Acne Combined Vaccine—Lederle.—A suspension of killed acne bacilli and killed Staphylococcus albus and staphylococcus aureus. For a discussion of Mixed Bacterial Vaccines, see New and Nonofficial Remedies 1921, p. 314. Acne Combined Vaccine—Lederle is marketed in various size packages containing graduated doses of the vaccine. Lederle Antitoxin Laboratories, New York (Jour. A. M. A., Oct. 1, 1921, p. 1103).

Protolac.—A brand of calcium caseinate—N. N. R. For a description of the composition, actions and uses, and dosage, see Jour. A. M. A., Sept. 24, 1921, p. 1023. Dry Milk Co., New York.

Benzyl Succinate—Seydel.—A brand of benzyl succinate—N. N. R. For a description of the properties, actions and uses, and dosage, see Jour. A. M. A., Sept. 24, 1921, p. 1023. Seydel Manufacturing Co., Jersey City, N. J. (Jour. A. M. A., Oct. 8, 1921, p. 1183).

Copper Citrate—P. W. R.—A brand of copper citrate— N. N. R. For a discussion of the actions, uses and dosage of copper citrate, see New and Nonofficial Remedies 1921, p. 88. Powers-Weightman-Rosengarten Co., Philadelphia.

Mercury Benzoate—P. W. R.—A brand of mercuric benzoate—N. N. R. For a discussion of the actions, uses and dosage of mercuric benzoate, see New and Nonofficial Remedies 1921, p. 192. Powers-Weightman-Rosengarten Co., Philadelphia.

Mercury Cyanide—P. W. R.—A brand of mercuric cyanide—N. N. R. For a discussion of the action, uses and dosage of mercuric cyanide, see New and Nonofficial Remedies 1921, p. 183. Powers-Weightman-Rosengarten Co., Philadelphia.

Mercury Succinimide—P. W. R.—A brand of mer-

curic succinimide—N. N. R. For a discussion of the actions, uses and dosage of mercuric succinimide see New and Nonofficial Remedies 1921, p. 196. Powers-Weightman-Rosengarten Co., Philadelphia.

Silver Citrate—P. W. R.—A brand of silver citrate— N. N. R. For a discussion of the actions, uses and dosage of silver citrate, see New and Nonofficial Remedies 1921, p. 333. Powers-Weightman-Rosengarten Co., Philadelphia.

Silver Lactate—P. W. R.—A brand of silver lactate—N. N. R. For a discussion of the actions, uses and dosage of silver lactate, see New and Nonofficial Remedies 1921, p. 334. Powers-Weightman-Rosengarten Co., Philadelphia.

Procaine-Adrenalin Hypodermic Tablets No. 2.—Each contains procaine-Abbott (see New and Nonofficial Remedies 1921, p. 34) 0.02 gm. (1-3 grain), adrenalin 0.00004 gm. (1-1500 grain) and sodium chloride, sufficient so that when the tablet is dissolved in 1 c.c. of water the resulting solution is isotonic. The Abbott Laboratories, Chicago (Jour. A. M. A., Oct. 29, 1921, p. 1423).

Patent Medicines in England.—Broadly speaking, the ethical standards of the "patent medicines" industry in Great Britain in 1921 is that which obtained in the American "patent medicine" industry prior to the passage of the Food and Drugs Act in 1907. As long ago as 1912 the British Parliament created a Select Committee on "Patent Medicines". The Committee Published a report in 1914. The coming of the World War favored the nostrum interests and no legislative action was taken until 1920, when a Proprietary Medicine Bill was introduced into the House of Lords. Now comes the Medical Press and Circular (London) complaining that the bill has been pigeonholed. This publication points out that in 1920 the British government received revenue from the sale of "patent medicines" totaling 1,332,661 pounds, and that the very fact that a government hard up for revenue should be able to obtain so vast a sum from a business so largely tinctured with fraud and such a menace to the public health may be "a sufficient reason" in explanation of the British government's attitude of "innocuous desuetude" toward this bill (Jour. A. M. A., Oct. 1, 1921, p. 1107).

Tired Rabbits for Diabetes and Ring-Tailed Monkeys for Sex Stimulation.—In March 1919, an article by T. Webster Edgar appeared in the New York Medical Journal in which Edgar stated that he had treated successfully twenty cases of definite diabetes with intramuscular injections of his diabetic serum. No information was given regarding the serum except that it was prepared from normal blood after the animal is exercised to the point of fatigue. Subsequently, newspaper articles appeared in which Edgar is quoted as using the blood of rabbits first placed on a treadmill to produce fatigue. In November 1920, an article by Edgar appeared in the New York Medical Journal on "Sterility, Sex Stimulation and Endocrines" in which he stated that he was interested in sex stimulation and that he had a serum which he was using with success in this condition. During the last year newspapers have carried sporadic reports of alleged remarkable results produced by Dr. Thomas Webster Edgar of New York through the transplantation of "interstitial gland" taken from "a special species of orang-outang". In a letter to a layman Edgar stated that the treatment was successful and that he was now treating all cases by this method, and that the fee for the operation was five hundred dollars inclusive of the sanitarium. Commencing Sunday, Oct. 1st, 1921, a series of sensational articles appeared regarding one of Edgar's alleged monkey-gland implantations. The material is played up in the style typical of yellow journalism. The statement that appeared in these articles to the effect that Edgar "is a member of the County Medical Society of New York" is incorrect. Edgar is not a member. The newspaper claim that Edgar is "an authority on glandular transplantation" should be accepted with reservations (Jour. A. M. A., Oct. 15, 1921, p. 1272).

Sal Hepatica.—Little information is given, or apparently ever has been given, by the proprietors, (The Bristol-Myers Co.,) in regard to the composition of Sal Hepatica. Some years ago medical journal advertisements contained the statement that it contained all the "Tonic, Alterative and Laxative Salts of the celebrated 'Bitter Waters' of Europe * * * fortified by the addition of Lithium and Sodium Phosphates". It has also been claimed that Sal Hepatica is "a saline combination with the addition of Sodium Phosphate and Lithia Citrate."

The label of a recently purchased specimen contained the declaration, "Sal Hepatica is an effervescent saline combination possessing medicinal properties similar to the natural 'Bitter Waters' of Europe, and fortified by the addition of Sodium Phosphate." In view of these indefinite statements the A. M. A. Chemical Laboratory made an analysis of the product. The analysis showed it to have the following composition: sodium phosphate anhydrous 4.4 per cent, sodium sulphate anhydrous 26.5 per cent, sodium tartrate anhydrous 12.7 per cent, sodium bivarbonate 19.5 per cent, tartaric acid, free 20.8 per cent, sodium chlorid 8.9 per cent, lithium phosphate trace, water of hydration (by difference) 7.2 per cent, Sal Hepatica, therefore, is essentially an effervescing mixture of dried sodium sulphate and sodium tartrate with a little dried sodium phosphate and table salt added. Sal Hepatica, then, is a simple effervescaent saline laxative. It is essentially secret in composition and is sold under claims that would be laughed at were the full formula of the product a matter of public knowledge (Jour. A. M. A., Oct. 29, 1921, p. 1438).

PROGRESS

Abstracts to be submitted to Section Supervisors.

MEDICINE

SUPERVISORS:
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ON THE MECHANISM OF ABSORPTION FROM THE INTESTINE: Samuel Goldschmidt. (Phys. Rev., Vol. 1, No. 3.) The limits of this review do not permit of a detailed discussion of this article which is an excellent review of the literature on this subject from 1859 to the present time. Each explanation, founded on experimental work bearing upon the subject, is presented and the hypotheses arising therefrom are set down. The old theory of osmosis is referred to.

The work of Heidenhain, Cohnhein and Reed on the "vital" or physiological activity of the intestinal cells is taken up extensively. The purely mechanical explanation of the mechanism of intestinal absorption is fully discussed. Attention is called to the tendency of investigators to focus their attention on one factor only, which has failed to explain the phenomenon, instead of considering the intestine as a whole and each structure an integral part of the mechanism. Goldschmidt believes that the mechanism of intestinal absorption is qualitatively explained by the known laws of osmosis, but that the theory of osmotic pressure is inadequate to explain all the phenomena which may be attributed to osmosis. It is interesting to note that the controversy, from the start has centered around physical or physico-chemical theories and the ultimate analysis probably lies in the development of physical chemistry.

PAUL H. ROWE.

OCCULTISM WITH PARTICULAR REFERENCE TO SOME PHASES OF SPIRITISM: By Charles K. Mills. (Amer. Jour. of Med. Sc., July, 1921.) The Philadelphia Neurologist reviews in this article a subject which does not come entirely in the category of medically useless knowledge. He defines the term "mysticism" as commonly used, to be more or less synonomous with occultism.

The horrible sacrifice of lives during the world war acted as an exciting cause, but back of that there is a more profound reason—"a resurgence of that which is primitive." The terrible calamities of war aroused instincts and emotions and removed men, for a time, from the control of sound reason. Crimes, so prevalent today, he states are best explained psychologically as a turning, under peculiar stress, to instinctive tendencies.

The question naturally arises: What kind of men interest themselves in spiritualism? Some famous scientists have become enthusiastic supporters of spiritualism. He characterizes these men as leading lives in which reason and investigation pursue their way side by side with mystic tendencies. These men, while performing valuable scientific investigations on the one hand, nevertheless give evidences of marked mystical, or more plainly, instinctive and emotional tendencies not subjected to the usual intellectual control.

Ghosts are intimately associated with spiritualism in the minds of the public. He calls attention to the fact that many ghost stories have clearly fraudulent features. These are explained on the theory of hallucination, leaving out consideration of the definitely insane. Apparitions, to his experience in the majority of cases, occur in the period preceding deep sleep or in the period immediately after. Visual and other sensory hallucinations, it should be remembered, are indications of disordered cerebral action.

The so-called psychics, with their well known temperaments or well known constitutional tendencies, are of course easily influenced by mystic impressions. Concentration or disturbance of attention of spiritualists about their table may, and sometimes does, bring about muscular action induced by hypnotic phenomena of the auto or hetero suggestive type, so commonly misinterpreted.

Dr. Spiller characterizes men whom he has seen acting the part of mediums as "fat or fragile, sleek or frowzy."

J. C. MICHAEL.

BLOOD CHANGES IN A GASTRECTOMIZED PATIENT SIMULATING THOSE IN PERNICIOUS ANAEMIA: H. R. Hartman. (Am. Jour. Med. Sc., August, 1921.) Gastrectomy is a comparatively infrequently done operation. Dr. Hartman reports two cases of complete gastrectomy performed at the Mayo Clinic, which were carefully followed in their postoperative course to note any influence which it might have on the human economy in general. Hartman was struck by the similarity of the blood findings and symptoms in these cases, as compared with those found in pernicious anaemia. He assumes that possibly the lack of gastric ferments in these gastrectomized patients might have something to do with food splitting processes, rendering it abnormal, and resulting in hemolysis of the blood, or serving as a detriment to the blood forming organs. Description of the blood findings and symptoms are closely paralleled by typical cases of pernicious anaemia.

F. J. HIRSCHBOECK

THE TRANSFUSION OF BLOOD, WITH A REPORT OF 186 TRANSFUSIONS: I. S. Ravden and Elizabeth Glenn. (Am. Jour. Med. Sc., May, 1921.) A rather exhaustive review of the history of transfusion is given. The indications given are:

(1) Those due to loss of blood, such as from acute

hemorrhage, or long continued blood losses, smaller in extent.

(2) Diseased blood conditions due to poor hematopoietic function, decreased coagulability, decreased oxygen capacity, poor bactericidal or anti-toxic properties of the blood, and diminished nutrition.

(3) Shock.

One hundred and eighty-six transfusions were done on eighty-seven patients, and their conclusions are based upon observations made therefrom.

They are particularly optimistic concerning its value in acute hemorrhage where the limit of bleeding has not been reached, as well as in melena and in the hemorrhage of hemophilia. It is of value in debilitated or anemic individuals, in whom operations are contemplated. Cases of shock associated with hemorrhage are more amenable to treatment than those in which hemorrhage has not occurred. Its value in hastening remissions in pernicious anemia is mentioned. Its negative value in acute infections, acute leukemia and a plastic anemia, is in accordance with that of other observers. They believe the direct and indirect methods of transfusion do not vary greatly as far as the reactions are concerned, and advise the use of the former on account of its simplicity.

The mortality due to transfusions was 1.09 per cent.

F. J. Hirschboeck.

EVIDENCES OF THE FUNCTION FROM THE PATHOLOGY OF THE KIDNEY TUBULE: L. A. Turley. (Ann. of Med., Nov. 1921.) Turley believes that a good deal of inaccuracy has existed regarding the structure and function of the kidneys on account of scientific investigation in renal physiology and pathology being improperly done. He has a concept of renal function which seems to be entirely his own, and yet, on account of its novelty is worthy of consideration. He has noted the cytologic similarity between the proximal convolution and descending portion of Henley's loop. Similarly, he notes a resemblance between the histologic components of the ascending loop of Henley and the distal convolutions. He therefore divides the uriniferous tubule into four parts on a structural and functional basis: (1) The glomerulus and capsule of Bowman; (2) The proximal convoluted tubule and the descending portion of Henley's loop; (3) The thin portion of the loop, which in structure is not analogous to any of the other components; (4) The ascending part of Henley's loop and the distal convoluted tubule.

His observation concerning the course of the tubules through the various parts of the kidney, and their relation to each other, is interesting. He has accurately measured the diameters of the tubules, the numbers of convolutions, etc., with painstaking detail.

Through studies carried on by the author in partially degenerated and atrophied kidneys, he noted the following in the remaining normal tubules: (1) The glomerulus had increased in size materially. (2) The epithelium of the first few turns of the proximal convoluted tubules had assumed the flat, squamous form covering the glomerular tuft and lining the capsule of Bowman. (3) The remainder of the proximal tubule had increased at least twofold in diameter and length. (4) the descending arm of Henley's loop had similarly increased in diameter, and had become more tortuous throughout. (5) The thin portion of the loop was only a trifle enlarged, and the distal convoluted tubules had undergone but very little increase.

He concludes from these facts: (1) That the hyperplasia of the proximal system and the comparatively slight change in the distal convolutions is an index that the proximal system plays a larger part in the formation of urine. (2) In the alteration of the epithelium in these hyperfunctioning proximal tubules, approaching the type found in the capsule of Bowman, he believes there is brought about an assumption of the function of urinary formation in the proximal tubules. (3) The descending arm of the loop of Henley belongs functionally to the proximal tubules, as proved by the histologic changes that take place in these tubules.

His explanation of urinary secretion, however, which is dismissed with a few hundred words, and without any experimental support, is in vast contrast to the careful work done by other investigators, such as Cushny. What reasons he has for making his dogmatic statements regarding renal function, are not given. To quote his words: "The water and probably the simpler inorganic constituents pass through the epithelium of the glomerulus and the capsules. The more complexed, inorganic and organic elements, with the exception of sugar, are added by the proximal system. In the thin portion of the loop some of the water is reabsorbed into the blood. The distal system adds the sugar." He endeavors to prove this latter statement by the fact that in glycosuria he has noticed the infiltration of glycogen in the epithelium of the distal system, but nowhere else, indicating that the sugar is passing through the epithelium. There is nothing to prove that the glycogen is not being absorbed from the tubules rather than from the blood. The finding of casts in the distal system has been sufficient proof to the author that the thin portion of the loop reabsorbs the watery portion of the urine, as the casts, in his opinion, are due to the higher concentration of the urine.

F. J. Hirschboeck.

SURGERY

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THE ANATOMY AND SURGERY OF THE TRIGON: H. H. Young and M. D. Wesson. (Arch. of Surg., 1921, Vol. 3, p. 1.) The anatomy of the trigon, particularly the trigonal muscle, is described in detail. The view that the trigonal muscle pulls upon the "internal sphincter," has supplanted the belief that the opening of the "sphincter" is an inhibitory action. The present view is supported by endoscopic and cystoscopic studies and by the fact that obstruction to urination is generally followed by hypertrophy of the trigon with corresponding atrophy when the obstruction is removed.

Occasionally following marked obstruction there is an undermining of the trigon, the hypertrophied muscle being dissected away from the bladder wall. On contraction it stands up as a ledge, dividing the bladder into two parts and preventing complete emptying. After this ledge is split the trigon is able to resume its normal functions. If, however, the trigon has been completely removed, micturition is not normal in that the bladder is not completely emptied.

The trigonal muscle is composed of an extension of the longitudinal muscle layer of the ureters and their sheaths and is superimposed on the muscle of the bladder wall. The embryology and anatomy of the vesical orifice are described, showing that there is no true sphincter, but that the vesical orifice is closed by two loops or arcs of muscles, one arising from the internal circular layer and the other from the external longitudinal layer of the bladder wall. The trigonal muscle passes in the form of an arc through the weaker arcuate muscles at the vesical orifice, and on contraction mechanically pulls them open. When the trigon is removed, micturition is difficult and incomplete. On the removal of one-half of the trigon, the remaining half functions and the bladder can be emptied completely. This is also true when the trigon is split, but the functional result is not so perfect.

The study of the pharmacology of the trigon muscle shows that it is innervated by true sympathetic fibers, as it contracts on treatment with epinephrin and ergotoxin. No parasympathetic nerve endings were found to be present, as there was no response to pilocarpin or atropin. The tests with nicotine gave a response indicating the presence of ganglionic structures. The bladder muscle proper gave reactions to both sympathetic and parasympathetic nerves. From the evidence of pharmacologic and embryologic studies, which show an origin and a nervous control different from the rest of the bladder, it is deduced that the trigonal muscle contracts independently of the rest of the bladder.

The mechanism of urination was studied on a large series of cases with the cystoscope, from the urethral side and from inside the bladder through suprapubic cystotomies. Endoscopic studies of the opening and closing of the vesical orifice were also made. The action of the trigonal muscle was confirmed in every instance. When viewed from the urethra the vesical orifices was found not to be circular, but pear-shaped, and showed the sluggish lateral movement of the sides of the orifice, with the quick downward pull of the base, or trigonal muscle. When viewed from within the bladder the trigonal muscle was observed to contract and the vesical orifice to open, followed by normal voiding.

The changes in the trigon secondary to renal tuberculosis are described and six cases are cited showing the various stages. It is found that tuberculosis may produce not only marked thickening, but also shortening of the ureter, and that this in turn may cause traction on the vesical end of the ureter and trigon, leading to invagination of the margin of the ureteral orifice. This elevates the trigon on that side, leaving the bladder depressed around it.

Tuberculosis bacilli from the ureter find easy lodgement in these vesical pouches, while the greatly elevated ureteral ridge and trigon remain uninvolved. Ulceration may lead to undermining of the trigon, and separation from the bladder, as occurred in one case where the trigon was found floating, being attached only at the corners. It was cut loose and later removed through a cystoscope, but the patient thereafter had a small amount of residual urine. Urination is apparently normal as long as the trigon is not detached, but when the trigon becomes dissected free from the bladder muscle, micturition is less free and residual urine is present. If adhesions ar present between the diaphragm and the kidney, on respiration the shortened tuberculous ureter causes the trigonal ridge to play back and forth like a piston rod in the invaginated ureteral orifice.

Trigonal obstruction simulating hypertrophy of the prostate is discussed, and numerous cases are described in which an obstruction at the vesical orifice caused hypertrophy of the trigon, with consequent diagnosis of enlarged prostate. The trigon here acts as a great transverse dam on the floor of the bladder, behind the vesical orifice, preventing the passage of urine. A diverticulum, holding 250 to 300 c.c. of urine, may be formed in cases in which the obstruction has persisted sufficiently long to cause pouch formation back of the hypertrophied trigon, or an undermining of the trigon. In such a case, removal of the barrier is not sufficient to restore the normal function of the bladder, for the trigon acts as a septum shutting off the flow of urine through the prostatic urethra. The valve-like effect of the un-

dermined trigon must then be destroyed. The force of the contraction of the trigonal muscle dissected partly free from the bladder wall, irrespective of the amount of hypertrophy, is not properly applied to help in the opening of the vesical orifice.

The surgery of the hypertrophied trigon is discussed and eight detailed reports are given, illustrating the various conditions and methods of treatment. The obstruction can be attacked by the intra-urethral, perineal, and supra-pubic routes. In fairly small hypertrophies the trigon and median bar may be caught in a punch, devised by Young, and excised. For greater hypertrophies, Young has constructed a "cystoscopic trigonotome," which is used to divide the trigon either through the urethra or through a perineal incision. The operation of choice in large hypertrophies is a suprapubic cystotomy with splitting of the trigon with scalpel or scissors. Hemorrhage is controlled by sewing the cut edges with a continuous suture of chromic catgut.

There must be as little destruction of the muscle as possible, in order to preserve its function. The ideal in all cases is to restore as far as possible the base of the bladder to its original condition, removing the obstruction and its accompanying pouch, but leaving a maximum amount of uninjured trigonal muscle. The experience of the authors is that with the removal of all vesical obstructions and preservation of a maximum amount of trigon, the untoward symptoms disappear, and practically perfect function is restored.

O. S. Proctor.

GYNECOLOGY AND OBSTETRICS

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THE TWO FLAP LOW INCISION CAESAREAN SECTION: Alfred G. Beck. (Surg. Gyn. & Ob., Vol. 31, No. 3.) In reviewing the experience at the Long Island College Hospital, Beck notes that peritonitis was the cause of death of over 10 per cent of the patients delivered by the usual supra-pubic caesarean section. He describes the technique of his operation clearly with good illustrations. He also presents detailed records of 29 patients.

The essential points in the operation are:

(1) A low suprapubic abdominal incision. (2) Tranverse division of the peritoneum 2 cm. above the bladder and the formation of two flaps by; (a) stripping the bladder down from the anterior surface of the uterus, (b) lifting the upper layer by blunt dissection. (3) Midline incision in the lower uterine segment. (4) Extraction of the child by the hand or forceps. (5) Before separating the membranes, traction sutures are placed in the angles of of the uterine wound to protect the abdominal cavity from the "spill" when the secundines are delivered, and to hold the incision in suturing. (6) The uterus is closed by two layers of catgut. The upper peritoneal flap is brought well down and fastened by interrupted catgut, and the lower flap is brought up and sutured at least 1 cm. over the upper sutures. This forms a double barrier to extension of infection to the peritoneum. Should infection occur, spontaneous drainage is obtained either in the lower end of the abdominal found or through the cervix.

Of the 29 cases reported: 21 had been in labor at least 10 hours and 16 for more than 24 hours. The membranes had been ruptured in 19 and for more than 10 hours in 15 cases. Seventeen patients had been examined vaginally, and 5 had been examined repeatedly.

Convalescence was afebrile in 14. Seven ran a low grade fever for a few days, but with no elevation of the pulse or leucocytes; eight patients presented a more prolonged elevation of temperature with increase of pulse rate, but reached normal between the 7th and 10th days. This event was usually accompanied by the appearance of a purulent lochia, or breaking down of the abdominal incision.

The author concludes. (1) An efficient test of labor may be permitted in certain border-line cases of dystocia, since those who fail may be delivered by this technique, and with but little added risk. (2) The so-called, "potentially infected" woman may be delivered without sacrificing her uterus. Though the present series is too small to draw final conclusions, the mortality will certainly be less than that of crainotomy or hysterectomy following caesarean section in this class of cases.

Archibald L. McDonald.

EARLY SQUAMOUS CELL CARCINOMA OF THE CERVIX: T. S. Cullen. (Surg. Gyn. & Ob., Vol. 32, No. 2.) Cullen reports an interesting case of early cancer of the uterus. The patient had undergone a diagnostic curretage for intermittent bleeding. The curretings showed an area of unmistakable squamous cancer. Accordingly radical panhysterctomy was done. The specimen showed a submocous myoma and a small area of squamous cancer at the level of the internal os. The article is accompanied by a number of excellent microscopic studies showing the cell changes and structure of early cancer.

Archibald L. McDonald.

THE INDUCTION OF LABOR COMPLICATED BY HEMORRHAGE: E. P. Davis. (Amer. Jour. of Ob. and Gyn., Vol. 2, No. 1.) The author presents briefly his indications for the induction of labor as follows: 1. In primiparas, rarely for contracted pelvis. Most often to save the life or to conserve the health of a patient whose pregnancy is complicated by other conditions. 2. In multiparous patients: (a)

who give a history of previous difficult labors with disproportion between the fetal head and maternal pelvis, (b) a tendency to go overtime, (c) severe visceral disease, (d) in certain cases of marginal placenta previa by rupture of the membranes, (e) in fulminating toxemia, only when the patient is in or has completed the first stage of labor.

Davis prefers the use of bougies with vaginal packing. He objects to bags as less satisfactory, tend to displace the presenting part, and cause more pain and discomfort. The only objection to bougies is the possibility of separation of the placenta or injury of the placental site. He discusses three cases complicated by intrapartum hemorrhage. It was possible to demonstrate other causes for the bleeding and in none of them was there injury to the placenta. In a fourth case, one of the bougies had perforated the placenta, but there was no bleeding.

After careful consideration, the author accepts this method as the most uniformly satisfactory. The result most closely resembles normal labor, and he does not believe that bougies of themselves cause serious hemorrhage.

ARCHIBALD L. MCDONALD.

RHYMICITY OF THE PYLORIC SPHYNCTER: Homer Wheelon and J. Earl Thomas, (Amer. Jour. Phy. Vol. 54, No. 3, p. 460.) Because of the inability to explain, upon accepted theories, radiographic observations on the human stomach, the authors undertook a study on the physiology of the opening and closing of the plyoric sphyncter of dogs. Special attention was paid to the motility of the sphyncter. Forty-four experiments were performed under ether anaesthesia. They studied unanaesthatized dogs, radiographically. The experiments were carried out by means of pylorographs of balloons which were placed and maintained within the pyloric sphyncter. Two types of motility of the pyloric sphyncter were demonstrated; a. active rhythmic contractions, and b. tone waves. The rhythmic contractions occur at the rate of 3 to 5 per minute, and are contractions and relaxations of the sphyncter, followed by quiescence, and then a phase of inhibition prior to the next contraction. The tone waves, normally, are only sufficient to close the sphyncter, but changes in tonicity influence the degree of contractility. When the finger was introduced through the sphyncter of a dog with a permanent gastric fistula, violent contractions were excited which later passed off, but rhythmic pressure could be distinctly felt by the finger, and the sphyncter never completely relaxed. The authors believe that, aside from Cannon's theory of acid control of the pylorus, intragastric pressure and peristalsis bear some definite relation to the activities of the sphyncter.

PAUL H. ROWE.

PEDIATRICS

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SOME OBSERVATIONS ON THE SO-CALLED INANITION TEMPERATURE OF THE NEW-BORN: C. G. Grulee, and B. E. Bonar, (Amer. Jour. Dis. of Child., July 1921.) The writer states that for years it has been recognized that in a certain percentage of infants there occurs in the first few days of life a rise in temperature. This fever has not been accounted for satisfactorily. It is practically always transient in character and is accompanied by almost no disturbance of the general clinical findings. Holt states that from observations from the new-born at the Sloane Maternity hospital it was not uncommon to find cases which in the first five days of life showed temperatures up to 102 or 104, accompanied by no evidence of local disease, and ceasing with the establishment of the free secretion of milk.

The renewal of the discussion of the subject came with Von Reuss in 1912. He states that the various factors which may be responsible for the condition are as follows: (1) Change from meconium to milk flora in the bowel; (2) the irritative action of bacterial decomposition products or toxins, as well as nourishment constituents and their catabolic products as such, on the intestinal cells not used to such irritation, or the resorption products on the whole organism; (3) the presence of products of tissue destruction such as one finds in the first days of life; (4) as a result of the slight fluid intake and the water impoverishment, and from this the resulting concentration of the tissue fluids and decrease of diuresis; (5) poor development of the heat regulatory apparatus.

Further observations of the writers of this paper failed to reveal any regular relationship between the inanition or transitory fever of the new-born and the quantity of fluid ingested, nor does it reveal any definite relationship between the percentage of weight loss and the temperature. They were therefore forced to the conclusion that the temperature rise in question was not regularly to be explained on the basis of dehydration. It was also demonstrated that the forcing of food after this temperature is accompanied by a fall so rapid that it seems more than likely that there is a definite causal relation between the taking of food and the fall of temperature. The increased permeability of the intestinal mocosa for egg albumin during this period of life, as shown in a previous communication, more recently the confirmation of the finding of indican in the new born by Von Reuess, and the fact that the intestinal canal within 24 hours after birth was invaded by bacteria as far as the pylorus,

suggested that the temperature elevation at this time might be due to the absorption of some protein products, bacterial or otherwise, from the intestine of the new-born. With the stimulation of digestion and the flow of gastric and intestinal juices produced by the taking of foods, the meconium, which before contained small quantities of fluid and therefore a humidity too low for the growth of bacteria, was invaded by bacteria. The meconium consisted almost entirely of protein material, the destruction of which would most readily account for the presence of indican in such a large proportion of urines. With the introduction of breast milk, the putrefactive processes in the intestines were reduced and there was a fall in temperature. That the condition did not give rise to more serious symptoms than were present might be explained by the rapid change of condition within the intestinal canal.

R. N. ANDREWS.

THE DEGREE OF IMMUNITY TO DIPHTHERIA INSURED BY A NEGATIVE SCHICK TEST: Wm. H. Park, (Amer. Jour. Dis. of Child, July 1921.) There is good evidence supporting the view that sufficient antitoxin in the body to prevent the development of a positive Schick test under ordinary conditions will prevent the development of diphtheria. There can be no doubt that the injection of 500 units of anti-toxin gives an immunity for a period of from twelve to twenty days. A statement by Haven that 20 per cent of diphtheria bacilli are of a different type from the one used to produce toxin for the immunization of horses, and that the available monovalent anti-toxin will not completely neutralize the toxin made by this other type, and that, therefore, diphtheria may develop from infection with this other type in children showing a negative Schick test to the standard toxin, has not been confirmed. The evidence that anti-toxin is the only substance in the body that can prevent the toxin acting is also so conclusive that we can assume the negative Schick test means the presence of sufficient anti-toxin to neutralize it.

He recommends one-fortieth M. L. D. in 0.2 c.c. because he finds the large amount of fluid easier to give. Not only must the toxin be measured accurately, but it must be delivered wholly intracutaneously. If the small white area does not appear at the point of injection the test cannot be relied on. Too strong a toxin will give a larger percentage of postitives than will the standard amount.

A negative Schick test in cases which give active immunity, either natural or acquired, when the toxin used and technic employed has been suitable, gives an almost complete security from diphtheric disease, not only for the immediate time but for the future.

Those that have natural anti-toxin and those who acquire it through toxin-antitoxin injections may harbor diphtheria bacilli, and if they later suffer from tonsilitis, due to other microbes, throat cultures will contain diphtheria bacilli. The positive culture alone suggests but does not establish that the suspected case is one of diphtheria.

R. N. ANDREWS.

REPORT OF A CASE OF ANTENATAL INTESTINAL OBSTRUCTION, WITH SOME REMARKS ON OTHER FORMS OF INTESTINAL OBSTRUCTION IN INFANTS: Sidney A. Owen and Norman Lake (Brit. Jour. of Child. Dis., Vol. 17, July-Sept., 1920, p. 115.) The child at birth was found to have marked abdominal distension, but otherwise appeared to be normal. Thirty-six hours later the child appeared to be in very good condition, pulse and temperature normal, but had vomited greenish fluid, probably meconium, twice. The bowels had expelled a plug of mucus. A diagnosis of intestinal obstruction was made and an operation was resorted to at once. The obstruction was found one foot above the ileocecal valve and due to a band arising from the mesentery and descending to the upper surface of the bladder, probably the remains of the vitelline atery of the embryonic circulation coming from the superior mesenteric. Death followed in a few hours. The authors point out that since the child was born with signs of intestional obstruction, that it must have occurred in utero and that from the child's well being it would appear that even acute intestional obstruction in the child's prenatal existence need not be accompanied by symptoms supporting the view that the vigorous peristalis movements of the bowels commence only after birth.

E. F. ROBB.

ACUTE OTITIS MEDIA IN INFLUENZA FROM THE PEDIATRIC STANDPOINT: Peccival Nicholson, (Arch. of Ped., Dec. 1920.) The subject of acute otitis media is an especially important one for the pediatrist. In young children it is probably more frequently overlooked by the practitioner than any other disease of chilhood. Many cases are diagnosed central pneumonia when the otitis is the real source of trouble.

SYMPTOMATOLOGY: The infants and young children, who are most commonly affected have an entirely different symptomatology from the adults. It is varied and often very vague. The most constant symptom of acute otitis media is elevation of temperature ranging from 100 to 106, though the usual range is from 100 to 103. Dr. Holt says that of all inflammatory conditions which may be met in early life, otitis media perhaps most frequently gives rise to obscure febrile symptoms. Elevated temperatures in all cases of uncomplicated otitis media is not to be expected. Fevers in children and infants call for otoscopic examinations whenever the cause is not clear. The severity of the general condition occasionally overshadows all local symptoms of pain. Again in infants the first evidence of acute ititis

media is a purulent discharge without any previous evidence of pain. Older children experience more pain on account of the greater density of the drum membrane.

PROGNOSIS: Almost all cases with early diagnosis and proper treatment recover without any complication. The facility with which meningitis may be occasioned is explained by the close anatomical relation between the tympanic and cranial cavities through the medium of the petrosquamous suture.

DIAGNOSIS: The diagnosis is usually made by the otescope unless the membrane has previously ruptured.

TREATMENT: The early and free incision of the membrana tympani, not even waiting until the drum head bulges. Dr. Holt says: "the advantages of early paracentesis in acute otitis media can hardly be overstated. I favor incision of the drum membrane in cases of doubt rather than waiting for more definite indications, with the attendant risks of delay."

Every infant and child then with a temperature, or any of the exanthemata, or influenza should have careful and repeated otoscopic examinations. Diagnose carefully, treat early and never await spontaneous rupture of the ear.

R. N. ANDREWS.

VACCINATION OF PREGNANT MOTHERS AND NEW-BORNS WITH ESPECIAL REFERENCE TO THE DEVELOPMENT OF AN INTRAUTERINE IMMUNITY TO SMALL POX: Hans Mensching. (Archiv. fur Kinder. kunde, Vol. 68, No. 1, p. 24.) The author reports the results of his investigations conducted during a small pox epidemic in Hamburg in the winter of 1916-17. He vaccinated 684 new-born infants within the first few days of life usually on the first day. Among this number, he obtained successful reactions in 71 per cent. Typical local reactions associated with enlargement of the axillary glands were obtained in practically all cases. There were however very few constitutional symptoms that could be ascribed to vaccination. In only a few cases was the febrilo reaction commonly encountered in older children noted. The weight curve and the tolerance for food were apparently not affected. Prematures, weighing over 2300 grams, were also vaccinated with equally good results. That vaccination during infancy as successfully immunizes against small pox as when done later, he believes is shown by the report of Wolff. In order to determine whether vaccination produced immunity in the child during late pregnancy, he vaccinated 339 mothers and later vaccinated the infants. While in this series, the number of successful reactions was slightly less than in the unvaccinated mothers (14 per cent), yet he feels that the difference is so slight that the development for such immunity is rather the exception than the rule and should not be relied upon. He believes that new-borns withstand vaccination so well that one should not hesitate to employ it whenever there is an epidemic of small pox and danger of exposure.

M. D. OTT.

THE USE OF CONVALESCENT SERUM AS A PROPHYLACTIC AGAINST MEASLES: Franz V. Torday. (Zeit. fur Kinder., Vol. 29, No. 3, p. 148.) For those connected with institutions for the care of children, the problems of measles is a very serious one because of the almost universal susceptibility to this disease. It is also important in the case of young infants, in those in a weakened condition and in those who are already infected with tuberculosis. As a result of the investigations of Degkwitz who had employed convalescent serum with some success as a prophylactic against measles, the author injected the serum into 261 children of various ages ranging from infancy to 14 years who had never had measles and who had been exposed to the same. Of this number only 15 contracted the disease. The experiment was controlled by dividing the patients into two groups, to one group serum being given, members of the other group being treated in the usual way. The results obtained confirmed those of Degkwitz that convalescent serum given between the second and sixth day after exposure prevents the development of the disease with but few exceptions, though he can not agree that serum given in large doses as late as the 11th day is not efficacious as it did so in many cases. The dosage of the serum employed was in most instances 7.0-22.0 c. c. though in his later cases he used 3.5-4.0 c. c. with equally good results. The serum should be obtained from a donor between the 20th and 30th day of convalescence. The duration of the immunity could not be definitely determined, probably not in excess of 75 days in many cases, though he believes that, for obvious reasons, even a short period of immunity is of definite value in protecting those who need protection and in terminating epidemics in large institutions.

M. D. OTT.

FOOD REQUIREMENTS OF THE NEW-BORN INFANT: Harold K. Faber. (Arch. of Ped., Aug. 1921). The author contends that the colostrum intake of the infant during the first two or three days of life is wholly insufficient to supply the needs of the child. In a series of new-born children, complemental feeding was carried out usually with a suitable modification of cows' milk during the early days of life. The formula employed called for cows' milk, 100 c.c.; red label karo, 120 c.c. and 1 per cent barley water, 480 c.c. This gave percentage composition of 14 per cent sugar; 1.3 per cent protein and .3 to .6 per cent fat. Under this method of feeding the gain was 9 grams per kilo of body weight per day, and the infants ran a practically ideal weight curve. Additional food was administered so as to avoid any

danger of starving the infant, on the one hand, and of lowering the secretory activity of the mother's breast on the other hand.

Dr. Fritz B. Talbot, of Boston, in discussing the paper, emphasized the importance of fluid in the new-born infant. He stated that breast milk alone was not sufficient, and that the fluid intake of the infant should not be neglected. The loss of weight in the new-born was of two kinds: one was mechanical as the loss of meconium and urine, and the other was because the baby was burning up part of his body tissue to keep himself warm. He thought that the method used by Dr. Faber was good.

Dr. Harry Lowenburg, of Philadelphia, expressed the fear that the giving of extra milk in the early days of life might encourage the bottle habit. He stated that the fault lay in a lack of water and this could be made up in the form of water or glucose without presenting the bottle. Furthermore, he did nit see just why we should try to prevent the initial loss of weight as in spite of that loss children thrived and developed normally.

Dr. Lewis Webb Hill, of Boston, did not agree with Dr. Faber's paper, but felt that the new-born baby should have enough food, in the breast milk for its needs. He did not believe the extra food was an advantage and that the reason little breast milk was furnished was because the intestine was becoming infected with the ordinary bacteria and if it was flooded with extra food and a great deal of harm might be done.

The author in closing the discussion states that in his experience he did not find that water was sufficient for these babies; that they required food in addition to the breast and did much better when they had the food than when they did not.

R. N. ANDREWS.

BOOK REVIEWS

BACTERIOLOGY FOR NURSES. Harry W. Carey, M. D. Second Edition—1920 (F. A. Davis Company, London $1.25).

This little book fills a long felt need for an accurate and comprehensive treatise of a scientific subject written in simple terms. The history of Bacteriology is treated in a most creditable manner and is followed by a discussion of classification, morphology, biology and general distribution of bacteria. Then comes most essential detailed directions and principles of sterilization and disinfection. Infection, immunity and immunity reactions are lightly touched-upon and then comes very good descriptions and discussions of the more common pathogenic bacteria and with each is given a most practical discussion of the mode of infection, necessary sterilization and immunity reactions, if present. From this the non-medical person may receive a fairly complete knowledge of the usual pathogenic bacteria and their relation to the human body.

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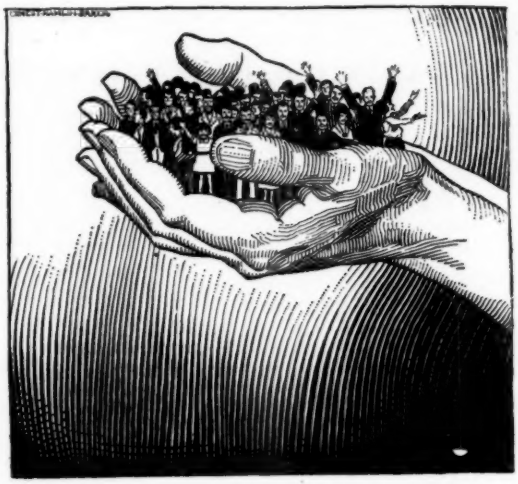

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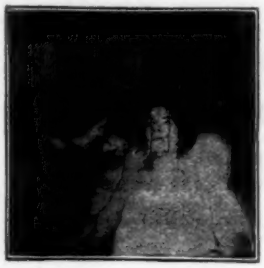

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